



REPORT

Soils Site Assessment

Ardmore Phosphate Rock Project

Submitted to:

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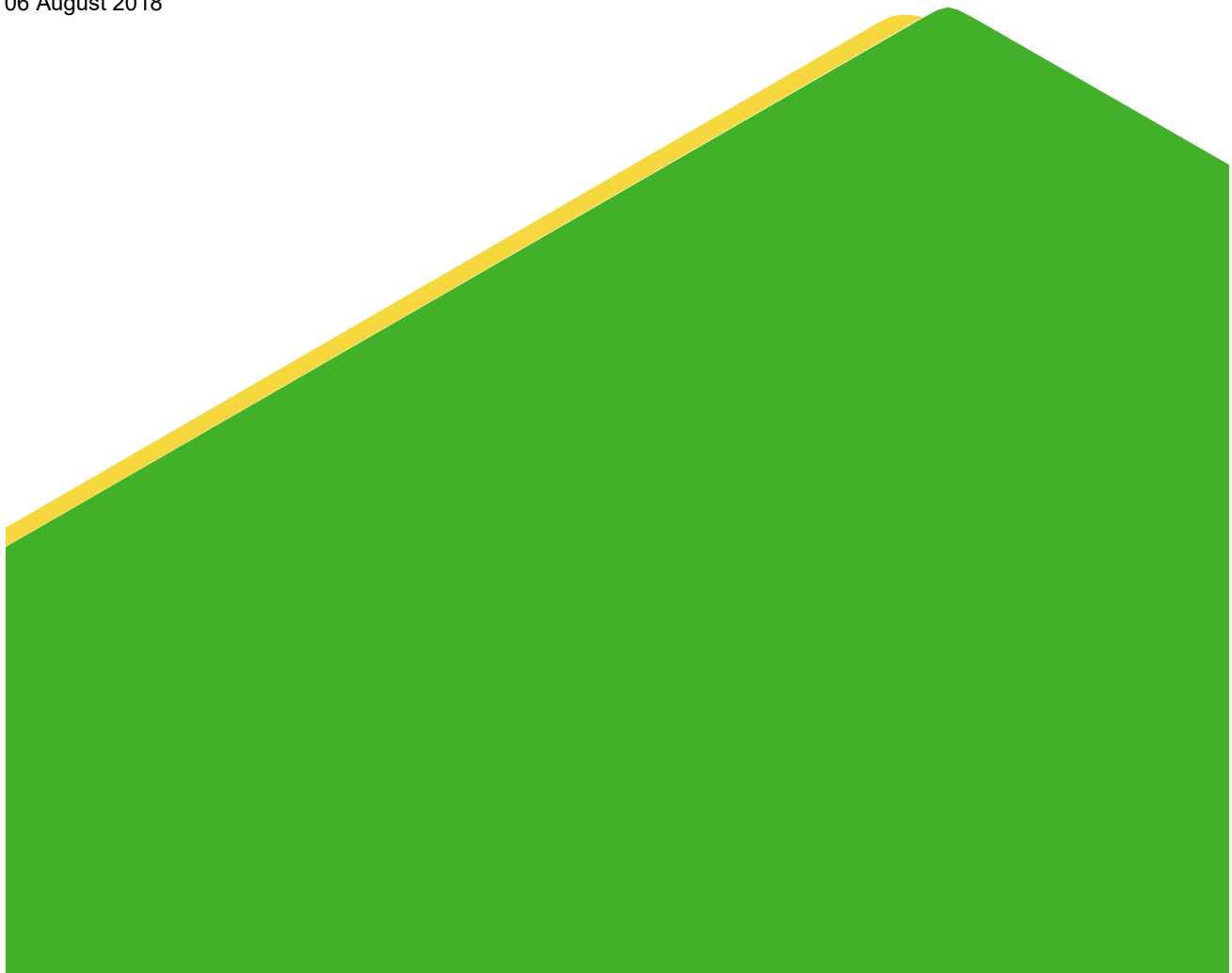
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1782517-22-R-Rev1

06 August 2018



Executive Summary

Introduction

Centrex Metals Ltd (Centrex) engaged Golder Associates Pty Ltd (Golder) to assess an area of the Ardmore Phosphate Rock Project (Ardmore) site for suitability and risks associated with soil disturbance.

The Ardmore Phosphate Rock Project site has been identified by Centrex to be a high-grade phosphate rock deposit. Centrex holds the Ardmore deposit in Mining Lease 5542 (Figure 1). The soils within the Mining Lease area were investigated, the findings of which are presented and discussed within this report.

Ardmore is a high-grade phosphate rock deposit located 128 km south of the City of Mount Isa and 23 km west of Dajarra in North West Queensland. It is understood that the deposit outcrops in places and is generally very shallow with the target phosphorite unit hanging wall and footwall average contact depths being 8.3 m and 12 m respectively.

A Start-up Operation is proposed to mine a small-scale pit (approximately 100 m wide, 140 m long and 10 m deep) in the southern area of the ML to extract 70,000 t of ore using shallow open-cut mining over a two to three-month period. The Full-scale Operation will mine phosphate ore from two shallow pits which will have an overall waste:ore stripping ratio of 3:1. The northern pit will have an average depth of 25 m and the southern pit 12 m. The life of mine is predicted to be between 8 and 15 years.

Soil Sampling Summary

The sample locations were selected on the basis of Start-up Operations and future development of the Full-scale Operation. Test pits were generally advanced to a maximum depth of 1.2 m below ground level, with sampling targeting the topsoil, subsoil and residual soil profiles. However, sample collection was dependent on the materials encountered and changes in lithology. A total of 29 soil samples analysed from 10 test pits were collected across the mining lease.

Across the Mining Lease there were areas of observed bedrock exposure. The Beetle Creek and Blazen Shale formations were observed near the northern portion of the lease area. Areas of exposed shale were observed in creek beds and erosion channels. There was also an area of granitic bedrock exposed near the middle of the lease area.

Results

The results for Exchangeable Sodium Percent and Calcium:Magnesium ratios indicate that three site areas (represented by TP01, TP03 and TP08) (Figure 2) which are located on soil profiles overlying the northern and southern deposit may have poor soil structure and be prone to some erosion.

The results at locations (TP01, TP03 and TP08) indicate that these soils are saline. These soils have high EC values and elevated concentrations of chloride. Water and sediment management measures should be implemented to minimise the risk to mobilising the salt with it the soil. During the Start-up Operations the temporary small-scale Tailing Storage Facility (see inset on Figure 2) is planned to be lined with an impermeable barrier, reducing the risk of mobilising the salt identified in these areas. The geochemistry (RGS 2018) findings also indicate that the overburden does have elevated concentrations of salts, which could become a significant aspect for site water management. However, the risk associated with saline drainage and rehabilitation will largely be overcome through the adoption of the proposed rehabilitation and backfilling plan.

Locations TP01 and TP08 have high concentrations of sulfates in the subsoils. Site observations indicate that gypsum was present at TP01. It is likely that gypsum is the source of the sulfates at these locations. The geochemical analyses found that at these locations, the overburden is non-acid forming to barren therefore there is no requirement for specific management of the overburden for sulphates (RGS, 2018).

Soil conservation and erosion and sediment control best practises should be utilised to reduce the risk of soil erosion and reduce the risk of salt and sulfate impacted soils being mobilised into the receiving environment. Minimising the duration of soils stockpiled on site will help reduce the risk of soil erosion occurring. Refer to Golder (2018) Surface water Impact Assessment for the mitigation measures recommended to reduce the risk of erosion.

Despite variability in the soils, with some soils across the site having poor physical and chemical properties and a moderate propensity for dispersion, the soils are typical of the region's arid environment. Proper management of site water quality and dust, as well as the usage of overburden to rehabilitate the pit, is likely to adequately reduce risks of impacts from the operations.

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1.0 INTRODUCTION

1.1 General

Centrex Metals Ltd (Centrex) engaged Golder Associates Pty Ltd (Golder) to assess an area of the Ardmore Phosphate Rock Project (Ardmore) site for suitability and risks associated with soil disturbance.

The Ardmore Phosphate Rock Project site has been identified by Centrex to be a high-grade phosphate rock deposit. Centrex holds the Ardmore deposit in Mining Lease (ML) 5542 (Figure 1). The soils within the Mining Lease area were investigated, the findings of which are presented and discussed within this report.

1.2 Objectives

The objective of this site soil assessment in specific key areas within the general mining lease area was to:

- understand the soil characteristics
- identify potential project constraints associated with the soil
- identify suitable and practical mitigation and management measure of identified constraints.

2.0 SITE DESCRIPTION

2.1 General Site Information

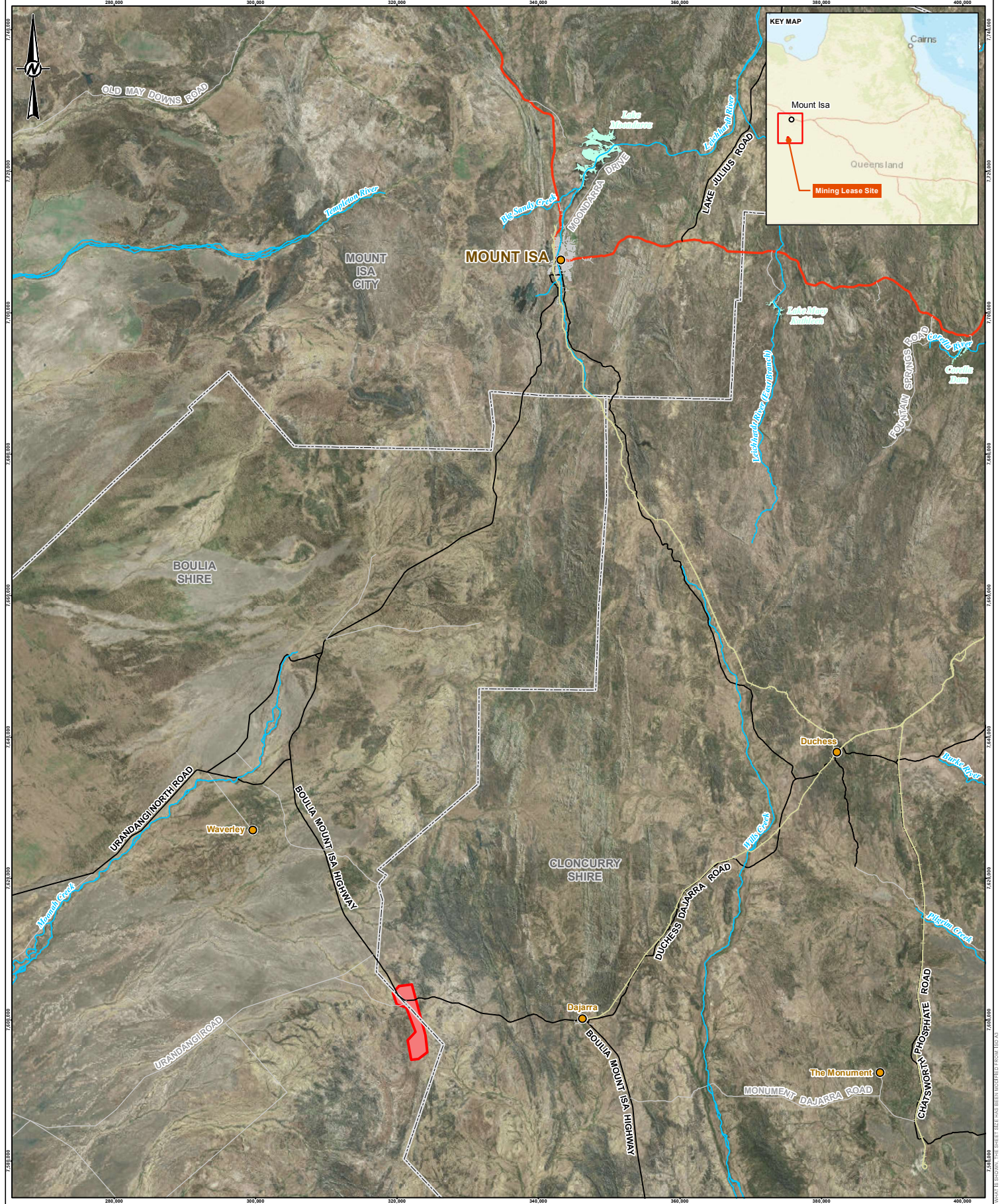
Ardmore is a high-grade phosphate rock deposit located 128 km south of the City of Mount Isa and 23 km west of Dajarra in North West Queensland. It is understood that the deposit outcrops in places and is generally very shallow with the target phosphorite unit hanging wall and footwall average contact depths being 8.3 m and 12 m respectively.

A Start-up Operation is proposed to mine a small-scale pit (approximately 100 m wide, 140 m long and 10 m deep) in the southern area of the ML to extract 70,000 t of ore using shallow open-cut mining over a two to three-month period. Depending on the viability and economic merits of the Start-up Operation, the goal is to expand operations to Full-scale Operation in the future, with the aim to supply fertilizer plants in Australia (which are currently reliant on imported phosphate) and export throughout the region. The Full-scale Operation will mine phosphate ore from two shallow pits which will have an overall waste:ore stripping ratio of 3:1. The northern pit will have an average depth of 25 m and the southern pit 12 m. The life of mine is predicted to be 10 years.

The nearest known weather station (Mt. Isa Airport) records an average annual rainfall of 464 mm, predominantly in summer.

The site has quite dense grass in the north-eastern portion of the Mining Lease potentially associated with nutrient richer alluvium relative to the remaining area of site which has moderate to sparse grass cover in places. Trees were noted growing across the site with more concentrated growths of spinifex grass and bush apple along drainage lines and the Split Creek flood plain which bisects the Mining Lease.

Observations of on-site water infiltration noted in previous investigations indicate that the site is very well drained, however some areas are known to pond with water during heavy downpours, likely due to the clay content in near-surface subsoils. A thin topsoil layer (<10 cm) comprising silty sand has been observed, during previous studies, across the majority of the site. Clay/sandy silt/gravelly deposits are red/orange in the southern section of the site with a contrast to a yellow colour in the northern zone. Rock outcrops are observed scattered throughout the Mining Lease.



LEGEND

- Locality
- Major Watercourses
- Road Type
 - Highway
 - Major Road
 - Local Road
 - Railway
 - Local Government Area
 - Reservoirs
- Centrex Mining Lease**
 - ML5542

FOR DISCUSSION PURPOSES ONLY

DRAFT

Coordinate System: GDA 1994 MGA Zone 54
Projection: Transverse Mercator
Datum: GDA 1994

CLIENT
CENTREX PHOSPHATE PTY LTD

CONSULTANT
GOLDER

DD/MM/YYYY	5/06/2018
DESIGNED	BG
PREPARED	BG
REVIEWED	DP
APPROVED	JR

NOTE(S)
Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, © OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

REFERENCE(S)
Locality, Mining Lease: © State of Queensland (DNRM) 2018
Roads, Major Watercourses, Local Government Area: © State of Queensland (Department of Natural Resources and Mines - DNRM) 2017
Reservoirs: © State of Queensland (DNRM) 2016

PROJECT
CENTREX ARDMORE PHOSPHATE

TITLE
PROJECT LOCATION

PROJECT NO. 1782517	CONTROL 022	REV. A	FIGURE 1
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2.2 Geology of the Project Area

The geological setting of the project area is a well-defined stratigraphic sequence that includes a stable Precambrian basement. The two major Precambrian units within the region are the Easter Creek Volcanic and the Sybella Granite. These form a basement of crystalline rocks around the Ardmore Cambrian inlier and by inference, underlie the younger sediments (Ardmore Rock Phosphate Deposit, Report No 1977/1).

The 1:100,000 Ardmore geology map (Australia 1:100,000 geological series, Sheet Number 6754) indicates that there are a number of surface geological units present within the mining lease and a brief description of the geological units, from the youngest to the oldest, is presented as follows:

- Alluvium (Quaternary): Clay, silt, sand, gravel; flood-plain alluvium
- Blazan Shale (Middle Cambrian): Siliceous shale, chert, siltstone, fine arenite, conglomerate, dolomitic and bituminous limestone, phosphate
- Beetle Creek Formation (Cambrian): Chert, siliceous shale with trilobite fossils, basal conglomerate
- Thornton Limestone (Middle Cambrian) - Grey crystalline limestone
- Riversdale Formation (Early Cambrian): Conglomerate, arenite, arkose, shale, mudstone, dolomite
- Sulieman Gneiss (Palaeo Proterozoic)- Felsic gneiss, augen gneiss, hornblende schist, amphibolite, quartzite

Phosphate mineralisation is located within the Beetle Creek Formation as successions of cherts, phosphatic siltstones, phosphate rock and minor shales.

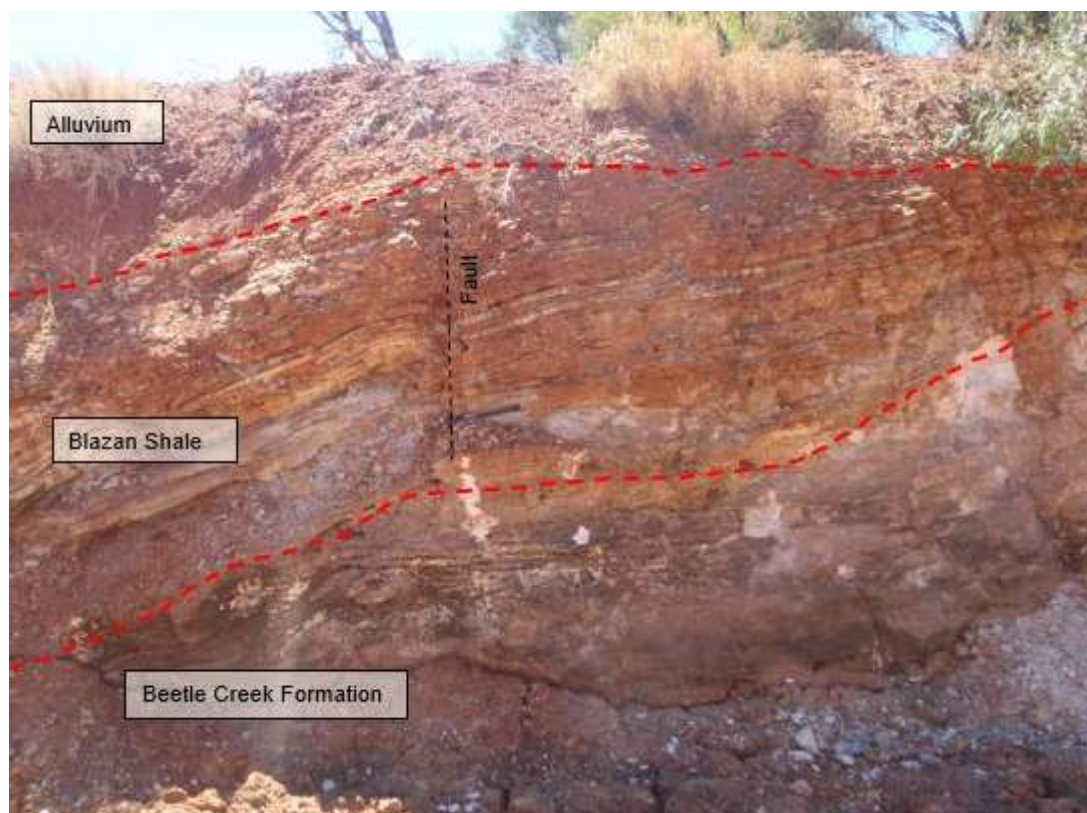


Plate 1: Example of near surface geology within the Southern Zone

2.2.1 Soil Resource Mapping

The Mining Lease has been mapped in accordance with the regional Queensland Soil maps database and it is divided into two different soil classes comprising Chromosols and Kandosols (Figure 2).

The Start-up Operation in the southern portion of the ML is located in an area mapped as Chromosol soils, with parts of the Full-scale Operation located within the mapped Kandosol soils.

3.0 REGULATORY FRAMEWORK AND GUIDANCE DOCUMENTS

The following acts and guidance documents are used for the management requirements for soils in Queensland.

- Soil Conservation Act (1986) – Outlines the laws relating to soil conservation and provided landholders management strategies to mitigate soil erosion.
- Environmental Protection Act (1994) – provides the duty of care to prevent environmental harm. The Act seeks to set out a program for the identification and protection of important elements of the environment (environmental values) and by creating a range of regulatory tools for controlling the activities of individuals or companies.

The guidance documents were used for interpretation and preparation of this report.

- Australian Soils and Landscapes (McKenzie *et al.*, 2004).
- Australian Soil and Land Survey field Handbook 3rd Edition (NCST, 2009).
- Best Practice Erosion and Sediment Control Manual (IECA, 2008)
- Interpreting Soil Test Results – What do all the Numbers Mean (Hazelton and Murphy, 2007).

4.0 SITE CHARACTERISATION

4.1 Sampling Locations and Rationale

Based on information provided to Golder and Golder's understanding of site conditions, the methodology and investigation locations took into account Centrex's planned operations and proposed development of the mine site.

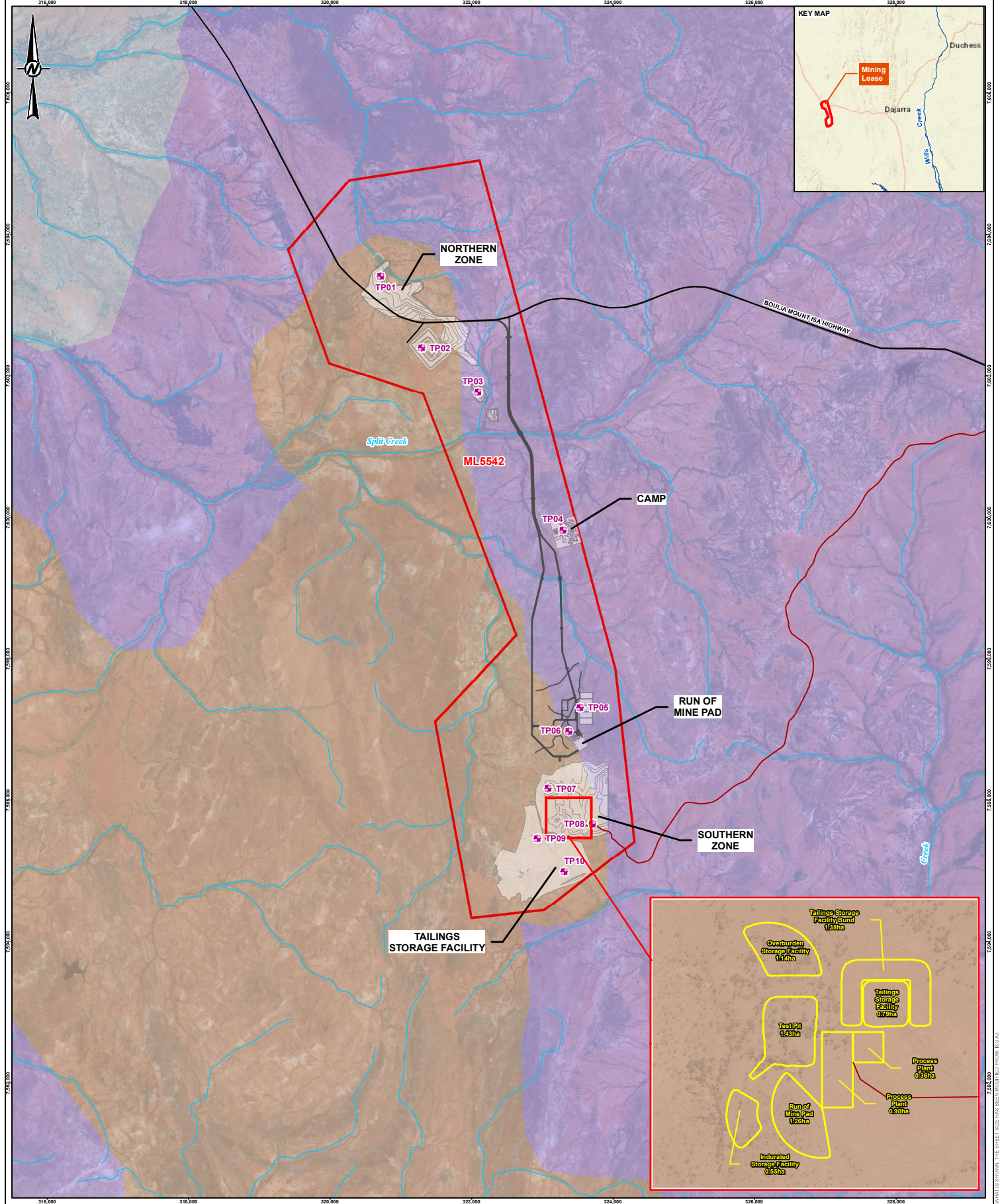
The sample locations were selected on the basis of Start-up Operations and future development of the Full-scale Operation (Table 1).

Three samples were collected to investigate the onsite soil type and quality at each of the 10 locations. Physical testing (particle size distribution (PSD) and Emerson classification) were conducted at a rate of 1 in 4 samples.

4.1.1 Soil Sampling Summary

Test pits were generally advanced to a maximum depth of 1.2 m bgl, with sampling targeting the topsoil, subsoil and residual soil profiles. However, sample collection was dependent on the materials encountered and changes in lithology.

The soil in each test pit was logged for the nature and condition of encountered lithology according to the Australian Soil Classification System (ASCS).



LEGEND

- Soil Test Pit Locations
- Roads
- Watercourses
- Centrex Phosphate Ltd
- Roads
- Start-up Operation Access Track
- Start-up Operation Features (Phase 1)
- Production Mine Infrastructure

Centrex Mining Lease

- ML5542

Combined Soils

- Chromosols
- Kandosols
- Vertosols

Coordinate System: GDA 1994 MGA Zone 54
Projection: Transverse Mercator
Datum: GDA 1994

CLIENT
CENTREX PHOSPHATE PTY LTD

CONSULTANT
GOLDER

DD/MM/YYYY 16/07/2018

DESIGNED DP

PREPARED DP

REVIEWED JR

APPROVED JR

FOR DISCUSSION PURPOSES ONLY

DRAFT

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1:50,000 at A3 METRES

NOTE(S)
Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, © OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

REFERENCE(S)
Soils: © CSIRO 2009.
Roads, Major Watercourses: © State of Queensland (Department of Natural Resources and Mines - DNRM) 2017.
Mining Lease: © State of Queensland (DNRM) 2018.
Full Mine Operations: provided by Centrex, March 2018.
Startup Operation Features: provided by Centrex, 31st May 2018.

PROJECT
CENTREX ARDMORE PHOSPHATE

TITLE
SOIL SAMPLE LOCATIONS

PROJECT NO. 1782517 **CONTROL** 022 **REV.** B **FIGURE** 2

TAILINGS STORAGE FACILITY

- Overburden Storage Facility 14.4ha
- Test Pit 14.3ha
- Run of Mine Pad 1.26ha
- Indurated Storage Facility 0.55ha
- Tailings Storage Facility Bund 0.55ha
- Tailings Storage Facility 0.75ha
- Process Plant 0.35ha
- Process Plant 0.90ha

A total of 29 soil samples analysed from 10 test pits were collected across the ML.

Table 1: Sampling Location and Justification

Location Name	Analysis	Location Justification
TP01	pH, EC, exchangeable cations, major cations, chloride, Total Kjeldahl Nitrogen (TKN), total phosphorus (P), total potassium (K), sulphur (S), total organic carbon (TOC), sodium adsorption ratio (SAR), Atterberg Emerson aggregate, PSD	Northern Pit (Full-scale Operation)
TP02		Overburden storage facility (Full-scale Operation)
TP03		Overburden storage facility (Full-scale Operation)
TP04		Workers' camp (Full-scale Operation)
TP05		Evaporation ponds (Full-scale Operation)
TP06		Processing facility (Full-scale Operation)
TP07		Southern Pit (Full-scale Operation)
TP08		Southern Pit (Full-scale Operation) and near Start-up Operation area
TP09		Tailings Storage Facility (Full-scale Operation)
TP10		

5.0 SITE OBSERVATIONS

5.1.1 Lithology

The soil lithology was variable on site depending on where the test pit was advanced in the site landform.

At locations TP04, TP05, TP09 and TP10, the test pits showed similar lithologies which were generally described as follows:

Depth	Lithology
0.0 - 0.3 m bgl	Sandy Loam to Light Clay, low plasticity, red to dark red, with plenty of silt, fine to medium sand and gravels, granular to blocky structure
0.3 - 0.6 m bgl	Sandy Clay Loam to Light Clay, low plasticity, dark red, with decreasing clay and silt content, plenty of fine to medium sand and gravels, massive structure.
0.6 -1.2 m bgl	Clayey Gravel, fine to coarse sub-rounded to angular gravel, dark red, with low to medium plasticity clay, plenty of sand, massive structure
	Weathered bed rock was intercepted at the bottom of test pits TP04 and TP05

At locations TP02, TP03, TP06 and TP07 the Blazen Shale formation was intercepted at shallow depths and pits were limited to 1 m depth. The general lithology at these locations was:

Depth	Lithology
0.0 - 0.3 m bgl	Silty Loam to Clayey Gravel, low plasticity, dark red, fine to coarse sub-rounded to angular gravel. with some slit and fine sand.
0.3 - 0.98 m bgl	Sandy Loam to Sandy Clay Loam, low plasticity, dark red to orangish red, with many fine to coarse sub-rounded to angular gravels and cobbles.

At locations TP01 and TP08, thicker alluvium was encountered, and the Blazen Shale parent material was not intercepted. The general lithology at TP01 and TP08 was:

Depth	Lithology
0.0 - 1.45 m bgl	Medium Clay, low to medium plasticity, dark red, with some silt and fine sand.

At TP01, crystalline inclusions were noted to be possibly gypsum. At TP08 white calcareous segregations were observed below 0.5 m bgl.

Across the Mining Lease there were areas of observed bedrock exposure. The Beetle Creek and Blazen Shale formations were observed near the northern portion of the lease area. Areas of exposed shale were observed in creek beds and erosion channels. There was also an area of granitic bedrock exposed near the middle of the lease area.

The test pit logs are attached in Appendix A, with the site and soil profile photographic log provided in Appendix B.

6.0 CHARACTERISATION AND ASSESSMENT OF RESULTS

Laboratory results of analyses conducted on soil samples are summarised and assessed in sections 0 and 6.2. Laboratory documentation is presented in Appendix C.

The interpretation of the soil analysis results is based on information provided in the *Interpreting Soil Test Results: What Do All the Numbers Mean?* (Hazelton and Murphy, 2007).

Table 2 below provides published guidance used to interpret the findings of the investigation, the table should be read in conjunction with the soil analytical results provided in Appendix C.

Table 2: Soil Interpretation Summary Information

Soil Analytes	Description				
Salinity – is the presence of soluble salts in the soil, generally including Ca^{2+} , Mg^{2+} , Na^+ , Cl^- , SO_4^{2-} and HCO_3^- . The clay content across the site was variable (refer to Table 3 below). The average clay content above was assumed as 25%. Therefore, the EC results will be compared against the 20-40% clay guide. (Rayment and Lyons, 2011)	Salinity Rating	10-20% Clay	20-40% Clay	40-60% Clay	60-80% Clay
	EC _{1:5} (mS/cm)				
	Very Low	<0.07	<0.09	<0.12	<0.15
	Low	0.07-0.15	0.09-0.19	0.12-0.24	0.15-0.3
	Medium	0.15-0.34	0.19-0.45	0.24-0.56	0.3-0.7
	High	0.34-0.63	0.45-0.76	0.56-0.96	0.7-1.87
	Very High	0.63-0.93	0.76-1.21	0.96-1.53	1.18-1.87
	Extreme	>0.93	>1.12	>1.53	>1.83
Ratio of exchangeable calcium (Ca) to exchangeable magnesium (Mg) used to support assessment of subsoil dispersibility. (Hazelton and Murphy, 2007)	Ratio		Rating		
	<0.1		Very low		
	0.1-1		Low		
	1-2		Medium		
	>2		High		
Sodic Soil – Sodicity is a measure of the exchangeable sodium (Na) in proportion to the total remaining exchangeable cations. Exchangeable sodium percent (ESP) results are used for classification of sodicity. (Northcote and Skene, 1972)	Rating		ESP (%)		
	Non-Sodic		0-6		
	Sodic		6-15		
	Strongly Sodic		>15		

Soil Analytes	Description				
<p>Emmerson aggregate class test – measures the instability of the soil structure when immersed in water.</p> <p>Definition of Emerson class (AS1289.3.8.1)</p>	Class 1	The soil shows a strong dispersing reaction			
	Class 2	The soil shows a moderate to slight reaction.			
	Class 3	The soil remoulded at the plastic limit disperses in water			
	Class 4	The remoulded soil does not disperse in water. Calcium carbonate (calcite) or calcium sulfate (gypsum) is present			
	Class 5	The remoulded soil does not disperse in water and the 1:5 soil/water suspension remains dispersed after 5 min			
	Class 6	The remoulded soil does not disperse in water and the 1:5 soil/water suspension begins to flocculate within 5 min			
	Class 7	The air-dried crumbs of soil remain coherent (do not disperse) in water and swells			
	Class 8	The air-dried crumbs of soil remain coherent (do not disperse) in water and do not swell			
<p>Soil Fertility – is the function of the physical, chemical and biological characteristics of the soil.</p> <p>(Rayment and Lyons, 2011) and (Hazelton and Murphy, 2007)</p>	Analyte	Very Low	Low	Moderate	High
	Nitrogen (as TKN) mg/kg	<500	500-1,500	1,500-2,500	2,500-5,000
	Phosphorus (mg/kg)	<10	10-20	>20-40	>40-100
	Organic Matter (%)	<0.9	0.9-2.7	2.7-4.5	4.5-7.5

6.1 Baseline Soil Chemistry

The results of laboratory analytical testing are presented in Appendix C. A summary of the analytical results with comparison to the adopted guidelines (Table 2) is provided in Table 3 below.

The main findings from the assessment of the analytical results are as follows:

- pH is consistent across the Mining Lease, generally neutral to alkaline.
- Results of the fertility testing for the soil samples analysed indicate the following:
 - Nutrient reserves, including total nitrogen, total potassium, and total sulphur are at low levels, with the exception of concentrations of total sulfur at TP01 and TP08 which are high.
 - Organic matter was generally found to be low, ranging from <0.5% to 1%
 - In addition to the low total nitrogen concentrations, the carbon (organic matter):nitrogen ratios are moderate to high, which is not ideal, leading to possible slow nutrient mineralisation within these soils.
- The chloride results are considered to be high at locations TP01, TP03, TP05, TP06 and TP08, particularly in the subsoils, however, in our experience this is consistent with local arid environments. The low Ca:Mg ratio (low) results are consistent with the strongly sodic soils identified with high ESP results. This generally indicates poor soil structure. The non-sodic soils had higher Ca:Mg ratios, which indicates more stable soil structures.
- Sulfate concentrations at locations TP01 and TP08 are high. Crystalline gypsum (CaSO_4) was observed in the soil profile in test pit TP01. Crystalline gypsum was not observed in the test pit at TP08; however, the results suggest that it was present.

From the site observations and test pit sample analysis, the main soil type identified was a Haplic, Eutrophic, Red Chromosol. This is consistent with the literature having a general description of “A non-sodic, texture contrast soil with high base status in the red clayed B2 horizon” (McKenzie *et al.* 2004). However, from analytical results, locations TP01, TP03 and TP08 appear to be more representative of Kandosol soils. The split of Chromosols and Kandosols across the ML appears to be different than depicted in Figure 2.

Table 3: Soil Results Summary Table

Parameter group	Southern Zone and TSF (TP07 to TP10)	Processing and Camp Areas (TP04 to TP06)	Northern Zone and Waste Rock Facility (TP01 to TP03)
pH	<p>Topsoil (0.0-0.3 m bgl): pH ranged from 6.8 to 7.2 (neutral to slightly alkaline)</p> <p>Subsoil (below 0.3 m): pH ranged from 6.4 to 8. (neutral to slightly alkaline)</p>	<p>Topsoil (0.0-0.3 m bgl): pH ranged from 6.0 to 6.7 (slightly acidic to neutral)</p> <p>Subsoil (below 0.3 m bgl): pH ranged from 6.5 to 8.9 (neutral to alkaline)</p>	<p>Topsoil (0.0-0.3 m bgl): pH ranged from 6.8 to 7.7 (neutral to slightly alkaline)</p> <p>Subsoil (below 0.3 m bgl): pH ranged from 7.3 to 7.8 (slightly alkaline)</p>
Electrical Conductivity (EC)	<p>Topsoil (0.0-0.3 m bgl): the topsoil samples have low to medium EC values.</p> <p>Subsoil (below 0.3 m): the subsoil samples have low to extreme EC values.</p> <p>Generally, the EC values increased with depth. There is a notable difference between the topsoils EC and the subsoil EC values, particularly at TP08.</p>	<p>Topsoil (0.0-0.3 m bgl): the topsoil samples have very low EC values.</p> <p>Subsoil (below 0.3 m): the subsoil samples have medium to high EC values.</p>	<p>Topsoil (0.0-0.3 m bgl): the topsoil samples have low to extreme EC values.</p> <p>Subsoil (below 0.3 m): the subsoil samples have low to extreme EC values.</p> <p>Generally, the EC values increased with depth. There is a notable difference between the topsoils EC and the subsoil EC values, particularly at TP03.</p>

Parameter group	Southern Zone and TSF (TP07 to TP10)	Processing and Camp Areas (TP04 to TP06)	Northern Zone and Waste Rock Facility (TP01 to TP03)
ESP	<p>Topsoil (0.0-0.3 m bgl): the ESP values for topsoil indicate non-sodic to sodic soils.</p> <p>Subsoil (below 0.3 m): the ESP values for subsoil indicate non-sodic to sodic soils.</p>	<p>Topsoil (0.0-0.3 m bgl): the ESP values for the topsoil samples non-sodic to sodic soils.</p> <p>Subsoil (below 0.3 m): the ESP values for subsoil indicate non-sodic to sodic soils.</p>	<p>Topsoil (0.0-0.3 m bgl): the ESP values for the topsoil samples non-sodic to sodic soils.</p> <p>Subsoil (below 0.3 m): the ESP values for subsoil indicate non-sodic to strongly sodic soils.</p> <p>TP01 has high sodicity (ESP) results, across the soil profile, compared to the other investigation locations.</p>
Calcium: Magnesium Ratios	<p>Topsoil (0.0-0.3 m bgl): the Ca:Mg ratios for topsoil are high.</p> <p>Subsoil (below 0.3 m): the Ca:Mg ratios for subsoil are high.</p>	<p>Topsoil (0.0-0.3 m bgl): the Ca:Mg ratios for topsoil are low to medium.</p> <p>Subsoil (below 0.3 m): the Ca:Mg ratios for subsoil are low to medium.</p>	<p>Topsoil (0.0-0.3 m bgl): the Ca:Mg ratios for topsoil are low to high.</p> <p>Subsoil (below 0.3 m): the Ca:Mg ratios for subsoil are low to high.</p> <p>TP01 has low Ca:Mg ratio results, across the soil profile, compared to the other investigation locations.</p>

6.2 Particle Size Distribution, Atterberg Limits and Emerson Classification

Textural classifications recorded in the field were compared to the PSD analysis provided by the laboratory. The PSD was estimated by the laboratory according to Australian Standard AS1289.3.6.3, and size fractions and material descriptions are reported in accordance with AS1726 (refer to results in Appendix C). The laboratory is NATA accredited for these methods. The International particle size fractions are utilised, which vary from the AS1726 fractions.

Table 4: Particle Size Distribution and Dispersion Potential Test Results

Sample	% Clay (<2 µm)	% Silt (2-20 µm)	% Sand (20-2000 µm)	% Gravel (>2000 µm)	Emerson Classification Number	Atterberg Limit (% linear Shrinkage)
TP01_0.1-0.3	49	24	17	0	4	20.5
TP02_0.1-0.25	28	22	31	19	3	10.0
TP02_0.3-0.55	21	14	10	55	4	14.5
TP04_0.2-0.3	39	12	44	5	3	10.5
TP05_0.1-0.3	19	9	30	42	3	5.5
TP07_0.4-0.6	11	17	9	63	3	13.5
TP09_0.1-0.3	20	14	40	26	3	10.0
TP10_0.5-0.6	34	9	21	36	4	10.0

The liquid limit results, provided as part of the Atterberg Limit testing, generally support the variable plasticity of the materials which is a mixture of fine and coarse-grained soils observed in the field.

The linear shrinkage tests also form part of the Atterberg Limit testing and indicate that the soils from across the site range in linear shrinkages from 5.5% to 20.5% (indicative of slightly plastic to moderately plastic, shrink swell soils) and more likely to be tending towards rigid soils.

Soils which contain higher clay and silt content have higher water holding capacity. However, the increased clay and silt can decrease water infiltration. The soils which contain higher sand and gravel contents are more permeable to water infiltration, and therefore less suitable for dams and other water retaining structures.

The Emerson classification and Ca:Mg ratios are indicators of soil dispersivity or structural stability. Soils which are high in exchangeable sodium and exchangeable magnesium are generally more dispersive than those that are high in exchangeable sodium and exchangeable calcium. The majority of the results show low (Class 4) to moderate (Class 3) dispersivity levels, indicating these soils are described as *low to potential dispersive soils*.

7.0 SITE SUITABILITY

The results for ESP and Ca:Mg ratios indicate that the three site areas (represented by TP01, TP03 and TP08) which are located on soil profiles overlying the northern and southern deposit may have poor soil structure and be prone to some erosion. It is understood that the mine plan is based on a cut and cover process and that long-term stockpiling of soils is not planned. This will help to reduce the risk of erosion impacts to occur, in the areas where these soils are placed.

The results at locations (TP01, TP03 and TP08) indicate that these soils are saline. These soils have high EC values and elevated concentrations of chloride. Care should be taken with placing tailings in these areas, as the excess water may mobilise the salts and modify downgradient soil structure. Water and sediment management measures should be implemented to minimise the risk to mobilising the salt within the soil. From information provided by Centrex, during the Start-up Operations, the temporary small scale Tailing Storage Facility (see inset on Figure 2) is planned to be lined with an impermeable barrier, reducing the risk of mobilising the salt identified in these areas. The geochemistry (RGS 2018) findings also indicate that the overburden does have elevated concentrations of salts, which could become a significant aspect for site water management. However, the risk associated with saline drainage and rehabilitation will largely be overcome through the adoption of the proposed strip mining and rehabilitation plan, particularly for the Full-scale operation.

Locations TP01 and TP08 have high concentrations of sulfates in the subsoils. Site observations indicate that gypsum was present at least at TP01. It is likely that gypsum is the source of the sulfates at these locations. The geochemical analyses report has found that at these locations, the overburden is non-acid forming to barren therefore there is no requirement for specific management of the overburden for sulphates (RGS, 2018).

Soil conservation and erosion and sediment control best practises should be utilised to reduce the risk of soil erosion and reduce the risk of salt and sulfate impacted soils being mobilised into the receiving environment. Minimising the duration of soils stockpiled on site will help reduce the risk of soil erosion occurring. Refer to Golder (2018) *Surface Water Impact Assessment*, for the impacts and mitigation measures recommended to reduce the risk for erosion impacts.

Despite variability in the soils, with some soils across the site having poor physical and chemical properties and a moderate propensity for dispersion, the soils are typical of the region's arid environment. Proper management of site water quality and dust, as well as the usage of overburden to rehabilitate the pits, is likely to adequately reduce risks of impacts from the operations.

8.0 IMPORTANT INFORMATION

Your attention is drawn to the document "Important Information Relating to this Report", which is included in Appendix D. The statements presented in this document are intended to advise you of what your realistic expectations of this report should be, and to present you with recommendations on how to minimise the risks associated with the services provided for this project. The document is not intended to reduce the level of responsibility accepted by Golder, but rather to ensure that all parties who may rely on this report are aware of the responsibilities each assumes in so doing.

9.0 REFERENCES

Golder Associates Pty Ltd. (2018). Surface Water Impact Assessment. Report No:172517-025-R-RevB. Date July 2018.

Hazelton, P.A and Murphy, B.W. (2007) *Interpreting Soil Test Results – What Do All The Numbers Mean?* (2nd Edition) CSIRO Publishing.

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Northcote and Skene (1972) *Australian soils with saline and sodic properties*.

Rayment, G and Lyons, D (2011) *Soil chemical methods: Australasia*.

RGS Environmental Pty Ltd. (2018) *Geochemical investigation of overburden, footwall units, ore and tailings – Ardmore Phosphate Mine*. Report No: 2018002_RevB, dated 18 May 2018.

Signature Page

Golder Associates Pty Ltd



Stuart Smith
Environmental Scientist



Andrew Howes
Principal Environmental Scientist

SRS/AWH/srs

A.B.N. 64 006 107 857

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[https://golderassociates.sharepoint.com/sites/1782517/1782517/6.deliverables/022_soil assessment/1782517-022-r-rev1 -soil site assessment.docx](https://golderassociates.sharepoint.com/sites/1782517/1782517/6.deliverables/022_soil%20assessment/1782517-022-r-rev1-soil%20site%20assessment.docx)

APPENDIX A

Test Pit Logs



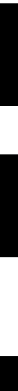
GOLDER

REPORT OF TEST PIT: TP01

CLIENT: Centrex
PROJECT: Ardmore Phosphate
LOCATION: Dajarra
JOB NO: 1782517

COORDS: 320711.0 m E 7603413.0 m N MGA94 56
SURFACE RL: DATUM: AHD
PIT DEPTH: 1.00 m
BUCKET TYPE: 900 mm

SHEET: 1 OF 1
MACHINE:
CONTRACTOR:
LOGGED: SRS DATE: 21-3-18
CHECKED: AWH DATE: 7-6-18

Excavation				Sampling		Field Material Description									
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION		MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS		
			0.0		TP01 0.10-0.30 m PSD			MC	Medium CLAY high plasticity, red (25 yr 4/6), with some fine to medium sand, 5-10mm angular blocky structure	M	F	Alluvium			
			0.40						TP01 0.40-0.60 m		stiff content increasing with depth				
			0.5												
					TP01 0.80-1.00 m					M	St	crystalline inclusions possible gypsum			
			1.0						TEST PIT DISCONTINUED @ 1.00 m						
			1.5												
			2.0												
			2.5												

This report of test pit must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F01e
RL3



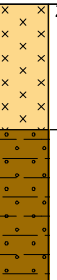
GOLDER

REPORT OF TEST PIT: TP02

CLIENT: Centrex
PROJECT: Ardmore Phosphate
LOCATION: Dajarra
JOB NO: 1782517

COORDS: 321294.0 m E 7602395.0 m N MGA94 56
SURFACE RL: DATUM: AHD
PIT DEPTH: 0.55 m
BUCKET TYPE: 900 mm

SHEET: 1 OF 1
MACHINE:
CONTRACTOR:
LOGGED: SRS
CHECKED: AWH
DATE: 22-3-18
DATE: 7-6-18

Excavation				Sampling		Field Material Description						
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
			0.0		TP02 0.10-0.25 m PSD			ZL	Silty LOAM low plasticity, dark red (2.5 YR 3/6) with some fine sand, angular blocky structure	D	MD	Colluvium
			0.25						TP02 0.30-0.55 m PSD			Sandy Clay LOAM low plasticity, dark red (2.5 yr 3/6), with fine to medium grained sand, with many fine to coarse subrounded to angular gravels and cobbles
			0.5								TEST PIT DISCONTINUED @ 0.55 m REFUSAL	
			1.0									
			1.5									
			2.0									
			2.5									

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GAP gINT FN. F01e
RL3



GOLDER

REPORT OF TEST PIT: TP03

CLIENT: Centrex
PROJECT: Ardmore Phosphate
LOCATION: Dajarra
JOB NO: 1782517

COORDS: 322089.0 m E 7601769.0 m N MGA94 56
SURFACE RL: DATUM: AHD
PIT DEPTH: 0.80 m
BUCKET TYPE: 900 mm

SHEET: 1 OF 1
MACHINE:
CONTRACTOR:
LOGGED: SRS
CHECKED: AWH
DATE: 22-3-18
DATE: 7-6-18

Excavation				Sampling			Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
			0.0		TP03 0.20-0.30 m TP03 0.40-0.60 m TP03 0.70-0.80 m			CG	Clayey GRAVEL fine to coarse grained, low plasticity, red, clay, fine to coarse, subrounded to angular, dark red (2.5 YR 3/6), with low plasticity clay, with some silt and some fine to medium sand	M	MD	Colluvium
			0.20	clay content decreasing with depth							Gravel, mixed lithology shale, silt stone	
			0.5						D		Blazen shale	
			1.0								TEST PIT DISCONTINUED @ 0.80 m REFUSAL	
			1.5									
			2.0									
			2.5									

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GAP gINT FN. F01e
RL3



GOLDER

REPORT OF TEST PIT: TP04

CLIENT: Centrex
PROJECT: Ardmore Phosphate
LOCATION: Dajarra
JOB NO: 1782517

COORDS: 323292.0 m E 7599820.0 m N MGA94 56
SURFACE RL: DATUM: AHD
PIT DEPTH: 1.10 m
BUCKET TYPE: 900 mm

SHEET: 1 OF 1
MACHINE:
CONTRACTOR:
LOGGED: SRS
CHECKED: AWH
DATE: 21-3-18
DATE: 7-6-18

Excavation				Sampling			Field Material Description										
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS					
EX	L	GROUNDWATER NOT ENCOUNTERED	0.0		TP04 0.20-0.30 m PSD			LC	Light CLAY low plasticity, dark red (2.5 YR 3/6), trace fine grained sand, >50mm angular, blocky structure	D	F - St	Quartz gravel and cobbles at surface					
			0.5										TP04 0.50-0.60 m		mica present	D	MD
			0.70														
	M		1.0	1.00	TP04 0.80-1.00 m			EXTREMELY WEATHERED GRANITE									
						TEST PIT DISCONTINUED @ 1.10 m											
			1.5														
			2.0														
			2.5														
			3.0														

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GAP gINT FN. F01e
RL3



GOLDER

REPORT OF TEST PIT: TP05

CLIENT: Centrex
PROJECT: Ardmore Phosphate
LOCATION: Dajarra
JOB NO: 1782517

COORDS: 323532.0 m E 7597310.0 m N MGA94 56
SURFACE RL: DATUM: AHD
PIT DEPTH: 1.00 m
BUCKET TYPE: 900 mm

SHEET: 1 OF 1
MACHINE:
CONTRACTOR:
LOGGED: SRS
CHECKED: AWH
DATE: 21-3-18
DATE: 7-6-18

Excavation				Sampling		Field Material Description							
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION		MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
			0.0	0.40	TP05 0.10-0.30 m PSD		SL	Sandy LOAM low plasticity, dark red (2.5 YR 4/6), with some silt, and some fine sand with many angular to subrounded fine to coarse gravel, <10mm blocky structure	D	St	Alluvium		
			0.5		TP05 0.40-0.60 m		CG		D	MD		Blazen shales	
			0.80		TP05 0.80-1.00 m								
			1.0				TEST PIT DISCONTINUED @ 1.00 m						
			1.5										
			2.0										
			2.5										
			3.0										

This report of test pit must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F01e
RL3



GOLDER

REPORT OF TEST PIT: TP06

CLIENT: Centrex
PROJECT: Ardmore Phosphate
LOCATION: Dajarra
JOB NO: 1782517

COORDS: 323374.0 m E 7596975.0 m N MGA94 56
SURFACE RL: DATUM: AHD
PIT DEPTH: 0.98 m
BUCKET TYPE: 900 mm

SHEET: 1 OF 1
MACHINE:
CONTRACTOR:
LOGGED: SRS
CHECKED: AWH
DATE: 21-3-18
DATE: 7-6-18

Excavation				Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	STRUCTURE AND ADDITIONAL OBSERVATIONS
			0.0					SL	Sandy LOAM fine to coarse, subrounded to angular, dark red (25yr 3/6), low plasticity, trave fine grained sand, rock structure apparent, appears medium dense		Alluvium
			0.30		TP06 0.10-0.30 m				clay content decreasing with depth	D	Gravel of mixed lithology shale and siltstone
			0.5		TP06 0.40-0.60 m					MD	
			0.80		TP06 0.80-0.95 m				Weathered SILTSTONE fine to coarse gravels and cobbles with some medium plasticity clay inclusions		
			1.0						TEST PIT DISCONTINUED @ 0.98 m REFUSAL		
			1.5								
			2.0								
			2.5								
			3.0								

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GAP gINT FN. F01e
RL3



GOLDER

REPORT OF TEST PIT: TP07

CLIENT: Centrex
PROJECT: Ardmore Phosphate
LOCATION: Dajarra
JOB NO: 1782517

COORDS: 323079.0 m E 7596163.0 m N MGA94 56
SURFACE RL: DATUM: AHD
PIT DEPTH: 0.90 m
BUCKET TYPE: 900 mm

SHEET: 1 OF 1
MACHINE:
CONTRACTOR:
LOGGED: SRS
CHECKED: AWH
DATE: 21-3-18
DATE: 7-6-18

Excavation				Sampling		Field Material Description								
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION		MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS	
EX	L	GROUNDWATER NOT ENCOUNTERED	0.0					CG	Clayey GRAVEL fine to coarse grained, subrounded to angular, red (2.5 YR 4/6), medium plasticity clay, with silt, 750 mm platy structure		D		Alluvium	
					DS 0.20-0.30 m									
					DS 0.40-0.60 m									
			0.60				with cobbles, rounded to sub-rounded							
			0.70		DS 0.70-0.90 m			SL	Sandy LOAM low plasticity, white, red and orange, with quartz, sandstone and siltstone and shale			White phosphate rock, blazen shale		
	M-H													
			1.0						TEST PIT DISCONTINUED @ 0.90 m REFUSAL					
			1.5											
			2.0											
			2.5											

This report of test pit must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F01e
RL3



GOLDER

REPORT OF TEST PIT: TP08

CLIENT: Centrex
PROJECT: Ardmore Phosphate
LOCATION: Dajarra
JOB NO: 1782517

COORDS: 323707.0 m E 7595666.0 m N MGA94 56
SURFACE RL: DATUM: AHD
PIT DEPTH: 1.05 m
BUCKET TYPE: 900 mm

SHEET: 1 OF 1
MACHINE:
CONTRACTOR:
LOGGED: SRS DATE: 22-3-17
CHECKED: AWH DATE: 7-6-18

Excavation				Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION		MOISTURE CONDITION	STRUCTURE AND ADDITIONAL OBSERVATIONS
			0.0				MC	Medium CLAY low to medium plasticity, dark red (2.5 yr 3/6), with some silt, trace of fine sand, polyhedral blocky structure			Rounded fine to coarse gravel and cobbles at surface
					TP08 0.10-0.30 m						Alluvium
			0.45								
			0.5		TP08 0.50-0.60 m			some white segregations		D St	
					TP08 0.70-0.90 m						
			1.0								
								TEST PIT DISCONTINUED @ 1.05 m			
			1.5								
			2.0								
			2.5								
			3.0								

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GAP gINT FN. F01e
RL3



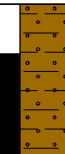
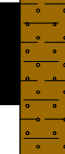
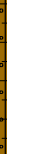
GOLDER

REPORT OF TEST PIT: TP09

CLIENT: Centrex
PROJECT: Ardmore Phosphate
LOCATION: Dajarra
JOB NO: 1782517

COORDS: 322929.0 m E 7575458.0 m N MGA94 56
SURFACE RL: DATUM: AHD
PIT DEPTH: 0.80 m
BUCKET TYPE: 900 mm

SHEET: 1 OF 1
MACHINE:
CONTRACTOR:
LOGGED: SRS
CHECKED: AWH
DATE: 21-3-18
DATE: 7-6-18

Excavation				Sampling			Field Material Description											
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION		MOISTURE CONDITION	CONSISTENCY	DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS				
			0.0		TP09 0.10-0.30 m			ZCL	Silty Clay LOAM low plasticity, dark red (2.5 yr 3/6), with some fine to medium sand, with some fine to medium gravel, 10 to 25mm blocky structure	D	F		Alluvium					
						0.5	0.60	TP09 0.40-0.60 m										
					TP09 0.70-0.80 m				with many fine to coarse subrounded to angular gravel				Blazen shale					
			1.0						TEST PIT DISCONTINUED @ 0.80 m REFUSAL									
			1.5															
			2.0															
			2.5															
			3.0															

This report of test pit must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F01e
RL3



GOLDER

REPORT OF TEST PIT: TP10

CLIENT: Centrex
PROJECT: Ardmore Phosphate
LOCATION: Dajarra
JOB NO: 1782517

COORDS: 323309.0 m E 7594989.0 m N MGA94 56
SURFACE RL: DATUM: AHD
PIT DEPTH: 1.00 m
BUCKET TYPE: 900 mm

SHEET: 1 OF 1
MACHINE:
CONTRACTOR:
LOGGED: SRS
CHECKED: AWH
DATE: 21-3-18
DATE: 7-6-18

Excavation				Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY	STRUCTURE AND ADDITIONAL OBSERVATIONS
			0.0				LC	Light CLAY low to medium plasticity, dark red (2.5 yr 3/6), with some silt and some fine sand, with many subrounded to subangular, gravel fine to coarse, trace of cobbles			Alluvium
			0.5	0.55	TP10 0.10-0.30 m						
					TP10 0.50-0.60 m PSD		CL	Clay LOAM low plasticity, dark red (2.5 yr 3/6), with some silt, with trace fine sand, with some cobbles			Blaze shale
					TP10 0.80-1.00 m						Shale and Limestone gravel/cobbles
			1.0					TEST PIT DISCONTINUED @ 1.00 m			
			1.5								
			2.0								
			2.5								
			3.0								

This report of test pit must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F01e
RL3

APPENDIX B

Photograph Log



TP01 Plate 1



TP01 Plate 2



CLIENT Centrex Metals Limited		PROJECT Centrex Geochemical and Soils Study				
DRAWN JK	DATE 17/05/2018	TITLE SELECTED SITE PHOTOGRAPHS				
CHECKED SRS	DATE					
SCALE Not to Scale		PROJECT No 1782517		APPENDIX No B	REV No 0	A4



TP01 Plate 3



CLIENT Centrex Metals Limited		PROJECT Centrex Geochemical and Soils Study				
DRAWN JK	DATE 17/05/2018	TITLE SELECTED SITE PHOTOGRAPHS				
CHECKED SRS	DATE					
SCALE Not to Scale		PROJECT No 1782517		APPENDIX No B	REV No 0	A4



TP02 Plate 1



TP02 Plate 2



CLIENT Centrex Metals Limited		PROJECT Centrex Geochemical and Soils Study			
DRAWN JK	DATE 17/05/2018	TITLE SELECTED SITE PHOTOGRAPHS			
CHECKED SRS	DATE				
SCALE Not to Scale		PROJECT No 1782517	APPENDIX No B	REV No 0	A4



TP02 Plate 3



CLIENT Centrex Metals Limited		PROJECT Centrex Geochemical and Soils Study		
DRAWN JK	DATE 17/05/2018	TITLE SELECTED SITE PHOTOGRAPHS		
CHECKED SRS	DATE			
SCALE Not to Scale		PROJECT No 1782517	APPENDIX No B	REV No 0 A4



TP03 Plate 1



TP03 Plate 2



CLIENT Centrex Metals Limited		PROJECT Centrex Geochemical and Soils Study			
DRAWN JK	DATE 17/05/2018	TITLE SELECTED SITE PHOTOGRAPHS			
CHECKED SRS	DATE				
SCALE Not to Scale		PROJECT No 1782517	APPENDIX No B	REV No 0	A4



TP03 Plate 3



CLIENT Centrex Metals Limited		PROJECT Centrex Geochemical and Soils Study			
DRAWN JK	DATE 17/05/2018	TITLE SELECTED SITE PHOTOGRAPHS			
CHECKED SRS	DATE				
SCALE Not to Scale		PROJECT No 1782517	APPENDIX No B	REV No 0	A4



TP04 Plate 1



TP04 Plate 2



CLIENT Centrex Metals Limited		PROJECT Centrex Geochemical and Soils Study			
DRAWN JK	DATE 17/05/2018	TITLE SELECTED SITE PHOTOGRAPHS			
CHECKED SRS	DATE				
SCALE Not to Scale		PROJECT No 1782517	APPENDIX No B	REV No 0	A4



TP04 Plate 3



CLIENT Centrex Metals Limited		PROJECT Centrex Geochemical and Soils Study			
DRAWN JK	DATE 17/05/2018	TITLE SELECTED SITE PHOTOGRAPHS			
CHECKED SRS	DATE				
SCALE Not to Scale		PROJECT No 1782517	APPENDIX No B	REV No 0	A4



TP05 Plate 1



TP05 Plate 2



CLIENT Centrex Metals Limited		PROJECT Centrex Geochemical and Soils Study			
DRAWN JK	DATE 17/05/2018	TITLE SELECTED SITE PHOTOGRAPHS			
CHECKED SRS	DATE				
SCALE Not to Scale		PROJECT No 1782517	APPENDIX No B	REV No 0	A4



TP05 Plate 3



CLIENT Centrex Metals Limited		PROJECT Centrex Geochemical and Soils Study			
DRAWN JK	DATE 17/05/2018	TITLE SELECTED SITE PHOTOGRAPHS			
CHECKED SRS	DATE				
SCALE Not to Scale		PROJECT No 1782517	APPENDIX No B	REV No 0	A4



TP06 Plate 1



TP06 Plate 2



CLIENT Centrex Metals Limited		PROJECT Centrex Geochemical and Soils Study		
DRAWN JK	DATE 17/05/2018	TITLE SELECTED SITE PHOTOGRAPHS		
CHECKED SRS	DATE			
SCALE Not to Scale		PROJECT No 1782517	APPENDIX No B	REV No 0 A4



TP06 Plate 3



CLIENT Centrex Metals Limited		PROJECT Centrex Geochemical and Soils Study			
DRAWN	JK	DATE	17/05/2018	TITLE SELECTED SITE PHOTOGRAPHS	
CHECKED	SRS	DATE			
SCALE	Not to Scale		PROJECT No	1782517	APPENDIX No B REV No 0 A4



TP07 Plate 1



TP07 Plate 2



CLIENT Centrex Metals Limited		PROJECT Centrex Geochemical and Soils Study				
DRAWN JK	DATE 17/05/2018	TITLE SELECTED SITE PHOTOGRAPHS				
CHECKED SRS	DATE					
SCALE Not to Scale		PROJECT No 1782517		APPENDIX No B	REV No 0	A4



TP07 Plate 3



CLIENT Centrex Metals Limited		PROJECT Centrex Geochemical and Soils Study		
DRAWN JK	DATE 17/05/2018	TITLE SELECTED SITE PHOTOGRAPHS		
CHECKED SRS	DATE			
SCALE Not to Scale		PROJECT No 1782517	APPENDIX No B	REV No 0 A4



TP08 Plate 1



TP08 Plate 2



CLIENT Centrex Metals Limited		PROJECT Centrex Geochemical and Soils Study		
DRAWN JK	DATE 17/05/2018	TITLE SELECTED SITE PHOTOGRAPHS		
CHECKED SRS	DATE			
SCALE Not to Scale	PROJECT No 1782517	APPENDIX No B	REV No 0	A4



TP08 Plate 3



CLIENT Centrex Metals Limited		PROJECT Centrex Geochemical and Soils Study			
DRAWN JK	DATE 17/05/2018	TITLE SELECTED SITE PHOTOGRAPHS			
CHECKED SRS	DATE				
SCALE Not to Scale		PROJECT No 1782517	APPENDIX No B	REV No 0	A4



TP09 Plate 1



TP09 Plate 2



CLIENT Centrex Metals Limited		PROJECT Centrex Geochemical and Soils Study			
DRAWN JK	DATE 17/05/2018	TITLE SELECTED SITE PHOTOGRAPHS			
CHECKED SRS	DATE				
SCALE Not to Scale		PROJECT No 1782517	APPENDIX No B	REV No 0	A4



TP09 Plate 3



CLIENT Centrex Metals Limited			PROJECT Centrex Geochemical and Soils Study				
DRAWN JK		DATE 17/05/2018		TITLE SELECTED SITE PHOTOGRAPHS			
CHECKED SRS		DATE					
SCALE Not to Scale			PROJECT No 1782517		APPENDIX No B	REV No 0	A4



TP10 Plate 1



TP10 Plate 2



CLIENT Centrex Metals Limited			PROJECT Centrex Geochemical and Soils Study				
DRAWN JK		DATE 17/05/2018	TITLE SELECTED SITE PHOTOGRAPHS				
CHECKED SRS		DATE					
SCALE Not to Scale							PROJECT No 1782517



TP10 Plate 3



CLIENT Centrex Metals Limited		PROJECT Centrex Geochemical and Soils Study		
DRAWN JK	DATE 17/05/2018	TITLE SELECTED SITE PHOTOGRAPHS		
CHECKED SRS	DATE			
SCALE Not to Scale		PROJECT No 1782517	APPENDIX No B	REV No 0 A4

APPENDIX C

Laboratory Documents

Table A: Soil Analytical Results

Field ID	Sample Depth	Lab Report Number	Sample Date	Baseline Chemistry																
				Moisture Content (dried @ 40°C)		pH (Lab)	Electrical Conductivity @ 25°C		Exchangeable Calcium		Exchangeable Magnesium		Exchangeable Potassium		Exchangeable Sodium		Cation Exchange Capacity	Calcium:Magnesium Ratio	Exchangeable Sodium Percent	Sodium Absorption Ratio
				%	pH		uS/cm	1	meq/100g	meq/100g	meq/100g	meq/100g	meq/100g	meq/100g	meq/100g	1				
EQL				1	0.1	1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1	0.1	0.1	0.01			
TP01	0.1-0.3	EB1807967	22/03/2018	6.9	7.7	4410	2.8	7.3	<0.2	1.9	120	0.38	15.5				18.8			
TP01	0.4-0.6	EB1807967	22/03/2018	6.2	7.6	3890	3	8.3	<0.2	1.7	132	0.36	12.9				18			
TP01	0.8-1	EB1807967	22/03/2018	9.9	7.7	6280	3.2	7	<0.2	2	122	0.46	16.7				12			
TP02	0.1-0.25	EB1807967	22/03/2018	3.3	6.9	10	10.3	4.1	0.4	<0.1	150	2.51	0.6				0.42			
TP02	0.3-0.55	EB1807967	22/03/2018	3.8	7.8	118	8.4	2.8	<0.2	112	300	<0.2	0.45							
TP03	0.2-0.3	EB1807967	22/03/2018	3.2	6.8	564	3.4	3.3	0.2	0.5	75	1.03	6.7				12.4			
TP03	0.4-0.6	EB1807967	22/03/2018	5.1	7.3	2250	7.7	11.2	0.2	2.6	218	0.69	12.2				28.6			
TP03	0.7-0.8	EB1807967	22/03/2018	6.7	7.4	3130	5.1	8.2	<0.2	3.4	168	0.62	20				29.9			
TP04	0.2-0.3	EB1807967	22/03/2018	1.9	6	11	2.6	3.2	0.6	<0.1	65	0.81	1.5				0.49			
TP04	0.6-0.5	EB1807967	22/03/2018	4	7.8	48	3.5	3.5	0.2	0.2	75	1.00	3.3				1.42			
TP04	0.8-1	EB1807967	22/03/2018	3	8.9	172	3.2	2.9	<0.2	0.4	65	1.10	5.6				5.49			
TP05	0.1-0.3	EB1807967	22/03/2018	2.2	6.7	24	4.4	2.8	0.7	0.1	81	1.57	1.4				0.47			
TP05	0.4-0.6	EB1807967	22/03/2018	4.8	6.8	575	13.4	9.4	0.4	0.2	236	1.43	1				3.26			
TP05	0.8-1	EB1807967	22/03/2018	7.4	8.3	1180	7.9	6.7	0.2	1.1	159	1.18	6.7				8.69			
TP06	0.1-0.3	EB1807967	22/03/2018	2.5	6.2	9	4.9	2.6	0.4	<0.1	80	1.88	0.3				0.14			
TP06	0.4-0.6	EB1807967	22/03/2018	5.5	6.5	277	15	10.7	0.4	1.1	274	1.40	4				2.78			
TP06	0.8-0.95	EB1807967	22/03/2018	4.1	8.1	1030	4.1	4.6	0.2	0.5	94	0.89	5				6.33			
TP07	0.2-0.3	EB1807967	21/03/2018	2.5	7.2	41	7.8	2.2	0.4	0.4	109	3.55	3.6				1.71			
TP07	0.4-0.6	EB1807967	21/03/2018	5	7	70	14.7	5.2	0.2	0.4	206	2.83	1.8				1.28			
TP07	0.7-0.9	EB1807967	21/03/2018	6.8	8	386	9.6	3.8	<0.2	0.3	140	2.53	2.5				3.04			
TP08	0.1-0.3	EB1807967	22/03/2018	5.7	7.3	366	8.8	3	0.3	1	131	2.93	7.5				11.4			
TP08	0.5-0.6	EB1807967	22/03/2018	7.8	7.3	4400	9.5	2.8	<0.2	1.2	136	3.39	9				6.65			
TP08	0.7-0.9	EB1807967	22/03/2018	8.8	6.4	4550	132	3.1	0.2	0.4	1360	42.58	0.3				6.62			
TP09	0.1-0.3	EB1807967	22/03/2018	2.6	6.8	18	6.5	1.8	0.4	<0.1	87	3.61	0.6				0.22			
TP09	0.4-0.6	EB1807967	22/03/2018	4.5	7.1	41	13.1	3.9	0.2	0.1	174	3.36	0.6				0.39			
TP09	0.7-0.8	EB1807967	22/03/2018	3.2	7.1	35	6.8	1.9	0.4	<0.1	92	3.58	0.6				0.23			
TP10	0.1-0.3	EB1807967	22/03/2018	1.8	6.6	22	7.9	2.6	0.4	<0.1	110	3.04	0.6				0.32			
TP10	0.5-0.6	EB1807967	22/03/2018	5.8	7.1	77	18.4	7	0.3	0.2	260	2.63	1				0.65			
TP10	0.8-1	EB1807967	22/03/2018	4	7.8	69	8.9	3.3	<0.2	<0.2	123	2.70	<0.2				1.15			
Topsoil Baseline Range (0.1-0.3)				1.8-6.9	6.7-7	9-4410	2.6-10.3	1.8-7.3	<0.2-0.7	<0.1-1.9	65-150	0.38-3.55	0.3-15.5				0.14-18.8			
Subsoil Baseline Range				3-9.9	6.4-8.9	41-6280	3-132	1.9-11.2	<0.2-0.4	<0.1-3.4	75-1360	0.36-42.58	<0.2-16.7				0.23-29.9			

Sample Quality Parameters																																
Field ID	Acid Extractable Potassium (Skene)			Calcium		Chloride		Magnesium		Sodium		Potassium		Sulphur (as S)		Nitrate (as N)		Nitrite (as N)		Nitrogen (Total Oxidised)		Total Kjeldahl Nitrogen (as N)		Bicarbonate Extractable P (Colwell)		Total Phosphorus (as P)		Total Organic Carbon		Organic Matter		Density
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%	g/cm3	
EQ1	100	10	10	10	10	10	10	10	10	10	10	10	10	100	0.1	0.1	0.1	0.1	0.1	0.1	20	20	20	5	2	5000	0.5	0.01				
TP01	100	960	310	7230	690	3810	<10	700	6.4	<0.1	6.4	230	240	<5	214	<5000	<0.5	2.42														
TP01	100	670	260	6300	620	3270	<10	600	7.8	<0.1	7.8	330	340	<5	206	<5000	0.8	-														
TP01	<100	13,300	3440	6440	1300	4200	<10	13,000	4.3	<0.1	4.3	120	120	<5	244	<5000	<0.5	-														
TP02	200	<10	<10	<10	<10	<10	<10	300	0.5	0.1	0.6	390	390	12	368	<5000	0.8	2.36														
TP02	<100	20	80	10	20	10	<10	400	0.5	<0.1	0.5	520	520	7	322	<5000	0.7	2.35														
TP03	100	30	20	850	10	530	<10	300	4.1	<0.1	4.1	230	230	42	874	<5000	0.5	-														
TP03	<100	460	150	3570	150	2170	<10	400	3.4	<0.1	3.4	240	240	11	892	<5000	0.5	-														
TP03	100	1540	340	4470	310	2800	<10	700	4.5	<0.1	4.5	160	160	9	1550	<5000	<0.5	-														
TP04	200	10	<10	<10	<10	<10	<10	<100	0.8	<0.1	0.8	210	210	<5	176	<5000	<0.5	2.45														
TP04	100	40	<10	<10	<10	40	<10	200	5.3	<0.1	5.3	270	280	<5	153	<5000	<0.5	-														
TP04	<100	40	20	70	10	140	<10	<100	14.5	<0.1	14.5	150	160	<5	195	<5000	<0.5	-														
TP05	300	<10	<10	20	<10	10	<10	300	0.4	<0.1	0.4	290	290	35	759	<5000	<0.5	2.38														
TP05	200	70	170	850	80	220	<10	300	2.6	<0.1	2.6	350	350	11	962	<5000	<0.5	-														
TP05	100	280	240	1800	150	780	<10	400	3.4	<0.1	3.4	270	270	8	1340	<5000	<0.5	-														
TP06	100	<10	<10	<10	<10	<10	<10	300	0.4	<0.1	0.4	330	330	98	2470	<5000	0.5	-														
TP06	100	20	70	360	30	120	<10	400	0.8	<0.1	0.8	430	430	87	1890	<5000	<0.5	-														
TP06	100	350	220	1370	170	550	<10	500	2	<0.1	2	290	290	20	1830	<5000	<0.5	-														
TP07	200	20	<10	<10	<10	40	<10	600	7	<0.1	7	390	400	45	758	<5000	0.6	-														
TP07	<100	60	20	30	<10	40	<10	500	3.4	<0.1	3.4	510	510	20	828	<5000	0.7	2.42														
TP07	<100	90	140	410	40	160	<10	500	5	<0.1	5	440	440	5	744	<5000	0.7	-														
TP08	200	80	30	450	<10	320	<10	200	2.2	0.2	2.4	320	320	<5	142	<5000	0.8	-														
TP08	100	10,200	3460	3570	420	2220	10	12,800	3.2	<0.1	3.2	280	280	<5	128	<5000	0.5	-														
TP08	100	10,300	3440	3760	420	2340	10	16,900	1.4	<0.1	1.4	70	70	<5	136	<5000	<0.5	-														
TP09	200	<10	<10	<10	<10	<10	<10	1100	0.9	0.1	1	380	380	81	24,300	<5000	0.8	2.36														
TP09	<100	10	20	30	<10	<10	<10	700	0.8	<0.1	0.8	300	300	251	24,700	<5000	0.7	-														
TP09	200	<10	10	20	<10	10	<10	1700	0.7	<0.1	0.7	360	360	81	16,900	<5000	0.8	-														
TP10	200	<10	<10	<10	<10	<10	<10	300	1.9	<0.1	1.9	360	360	265	3820	<5000	0.6	-														
TP10	100	40	30	40	<10	20	<10	300	9.7	<0.1	9.7	730	740	93	2880	6000	1	2.35														
TP10	100	20	20	30	<10	30	<10	500	5.2	<0.1	5.2	400	400	34	4150	<5000	0.5	-														
TP10	100-300	<10-960	<10-310	<10-7230	<10-690	<10-3810	<10	<100-1100	0.4-6.4	<0.1-0.2	0.4-7	210-390	210-400	<5-265	142-24,300	<5000	<0.5-0.8	2.36-2.45														
TP10	<100-200	<10-13,300	<10-3440	<10-6440	<10-1300	<10-4200	<10-10	<100-16,900	0.5-14.5	<0.1	0.7-14.5	70-730	70-740	<5-265	128-24,700	<5000-6000	<0.5-1	2.35-2.42														
Topsoil Baseline Range (0.1-0.3) Subsoil Baseline Range																																

CERTIFICATE OF ANALYSIS

Work Order : **EB1807967**

Client : **GOLDER ASSOCIATES**

Contact : **MR STUART SMITH**

Address : **P O BOX 1734**

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: 29

: 29

Page : 1 of 20

Laboratory : Environmental Division Brisbane

Contact : Carsten Emrich

Address : 2 Byth Street Stafford QLD Australia 4053

Telephone : +61-7-3243 7222

Date Samples Received : 28-Mar-2018 13:30

Date Analysis Commenced : 03-Apr-2018

Issue Date : 10-Apr-2018 13:02



Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Andrew Epps	Senior Inorganic Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Satishkumar Trivedi	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Satishkumar Trivedi	Senior Acid Sulfate Soil Chemist	Brisbane Inorganics, Stafford, QLD



Page : 2 of 20
Work Order : EB1807967
Client : GOLDER ASSOCIATES
Project : 1782517

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

Ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- ED093S (Cations-Soluble by ICP-AES): Sample EB1807967-001 (TP01_0.1-0.3) shows poor duplicate result due to sample heterogeneity. Confirmed by visual inspection.
- ED040S (Major Anions-Soluble by ICP-AES): Sample EB1807967-021 (TP08_0.1-0.3) shows poor duplicate result due to sample heterogeneity. Confirmed by visual inspection.
- EA058 Emerson: V. = Very, D. = Dark, L. = Light, VD. = Very Dark
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H+ + Al3+).



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)		Client sample ID						
		Client sampling date / time						
Compound	CAS Number	LOR	Unit	TP01_0.1-0.3	TP01_0.4-0.6	TP01_0.8-1.0	TP02_0.1-0.25	TP02_0.3-0.55
				22-Mar-2018 00:00	22-Mar-2018 00:00	22-Mar-2018 00:00	22-Mar-2018 00:00	22-Mar-2018 00:00
				EB1807967-001	EB1807967-002	EB1807967-003	EB1807967-004	EB1807967-005
				Result	Result	Result	Result	Result
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	7.7	7.6	7.7	6.9	7.8
EA006: Sodium Adsorption Ratio (SAR)								
Sodium Adsorption Ratio	----	0.01	-	18.8	18.0	12.0	0.42	0.45
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	4410	3890	6280	10	118
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	6.9	6.2	9.9	3.3	3.8
EA058: Emerson Aggregate Test								
Color (Munsell)	----	-	-	Red	----	----	Dark Reddish Brown	Red
Texture	----	-	-	Clay Loam	----	----	Sandy Clay Loam	Sandy Clay Loam
Emerson Class Number	EC/TC	-	-	4	----	----	3	4
EA150: Particle Sizing								
+75µm	----	1	%	24	----	----	39	61
+150µm	----	1	%	12	----	----	27	58
+300µm	----	1	%	5	----	----	22	57
+425µm	----	1	%	4	----	----	22	57
+600µm	----	1	%	3	----	----	22	57
+1180µm	----	1	%	1	----	----	21	56
+2.36mm	----	1	%	<1	----	----	20	54
+4.75mm	----	1	%	<1	----	----	15	43
+9.5mm	----	1	%	<1	----	----	<1	18
+19.0mm	----	1	%	<1	----	----	<1	<1
+37.5mm	----	1	%	<1	----	----	<1	<1
+75.0mm	----	1	%	<1	----	----	<1	<1
EA150: Soil Classification based on Particle Size								
Clay (<2 µm)	----	1	%	48	----	----	27	22
Silt (2-60 µm)	----	1	%	24	----	----	23	13
Sand (0.06-2.00 mm)	----	1	%	28	----	----	30	11
Gravel (>2mm)	----	1	%	<1	----	----	20	54
Cobbles (>6cm)	----	1	%	<1	----	----	<1	<1
EA152: Soil Particle Density								
Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3	2.42	----	----	2.36	2.35
ED006: Exchangeable Cations on Alkaline Soils								
Exchangeable Calcium	----	0.2	meq/100g	2.8	3.0	3.2	----	8.4



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)		Client sample ID				Client sampling date / time		TP01_0.1-0.3		TP01_0.4-0.6		TP01_0.8-1.0		TP02_0.1-0.25		TP02_0.3-0.55	
Compound	CAS Number	LOR	Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
ED006: Exchangeable Cations on Alkaline Soils - Continued																	
Exchangeable Magnesium	----	0.2	meq/100g	7.3	8.3	7.0	----	----	----	----	----	7.0	----	----	----	2.8	----
Exchangeable Potassium	----	0.2	meq/100g	<0.2	<0.2	<0.2	----	----	----	----	----	<0.2	----	----	----	<0.2	----
Exchangeable Sodium	----	0.2	meq/100g	1.9	1.7	2.0	----	----	----	----	----	2.0	----	----	----	<0.2	----
Cation Exchange Capacity	----	0.2	meq/100g	12.0	13.2	12.2	----	----	----	----	----	12.2	----	----	----	11.2	----
Exchangeable Sodium Percent	----	0.2	%	15.5	12.9	16.7	----	----	----	----	----	16.7	----	----	----	<0.2	----
ED007: Exchangeable Cations																	
Exchangeable Calcium	----	0.1	meq/100g	----	----	----	----	----	----	----	----	----	----	10.3	----	----	----
Exchangeable Magnesium	----	0.1	meq/100g	----	----	----	----	----	----	----	----	----	----	4.1	----	----	----
Exchangeable Potassium	----	0.1	meq/100g	----	----	----	----	----	----	----	----	----	----	0.4	----	----	----
Exchangeable Sodium	----	0.1	meq/100g	----	----	----	----	----	----	----	----	----	----	<0.1	----	----	----
Cation Exchange Capacity	----	0.1	meq/100g	----	----	----	----	----	----	----	----	----	----	15.0	----	----	----
Exchangeable Sodium Percent	----	0.1	%	----	----	----	----	----	----	----	----	----	----	0.6	----	----	----
ED022 : Acid Extractable Potassium (Skene)																	
Acid Extractable K (Skene)	----	100	mg/kg	100	100	<100	----	----	----	100	<100	<100	----	200	<100	<100	----
ED040S : Soluble Sulfate by ICPAES																	
Sulfate as SO4 2-	14808-79-8	10	mg/kg	960	670	13300	----	----	----	670	13300	<10	----	<10	----	20	----
ED042T: Total Sulfur by LECO																	
Sulfur - Total as S (LECO)	----	0.01	%	0.07	0.06	1.30	----	----	----	0.06	1.30	0.03	----	0.03	----	0.04	----
ED045G: Chloride by Discrete Analyser																	
Chloride	16887-00-6	10	mg/kg	7230	6300	6440	----	----	----	6300	6440	<10	----	<10	----	10	----
ED093S: Soluble Major Cations																	
Calcium	7440-70-2	10	mg/kg	310	260	3440	----	----	----	260	3440	<10	----	<10	----	80	----
Magnesium	7439-95-4	10	mg/kg	690	620	1300	----	----	----	620	1300	<10	----	<10	----	20	----
Sodium	7440-23-5	10	mg/kg	3810	3270	4200	----	----	----	3270	4200	<10	----	<10	----	10	----
Potassium	7440-09-7	10	mg/kg	<10	<10	<10	----	----	----	<10	<10	<10	----	<10	----	<10	----
EK057G: Nitrite as N by Discrete Analyser																	
Nitrite as N (Sol.)	14797-65-0	0.1	mg/kg	<0.1	<0.1	<0.1	----	----	----	<0.1	<0.1	<0.1	----	0.1	<0.1	<0.1	----
EK058G: Nitrate as N by Discrete Analyser																	
Nitrate as N (Sol.)	14797-55-8	0.1	mg/kg	6.4	7.8	4.3	----	----	----	7.8	4.3	0.5	----	0.5	----	0.5	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser																	
Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg	6.4	7.8	4.3	----	----	----	7.8	4.3	0.6	----	0.6	----	0.5	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser																	
Total Kjeldahl Nitrogen as N	----	20	mg/kg	230	330	120	----	----	----	330	120	390	----	390	----	520	----



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)		Client sample ID															
		Client sampling date / time						TP01_0.1-0.3		TP01_0.4-0.6		TP01_0.8-1.0		TP02_0.1-0.25		TP02_0.3-0.55	
Compound	CAS Number	LOR	Unit			EB1807967-001		EB1807967-002		EB1807967-003		EB1807967-004		EB1807967-005			
						Result		Result		Result		Result		Result			
EK062: Total Nitrogen as N (TKN + NOx)																	
^ Total Nitrogen as N			20	mg/kg		240		340		120		390		520			
EK067G: Total Phosphorus as P by Discrete Analyser																	
Total Phosphorus as P			2	mg/kg		214		206		244		368		322			
EK080: Bicarbonate Extractable Phosphorus (Colwell)																	
Bicarbonate Ext. P (Colwell)			5	mg/kg		<5		<5		<5		12		7			
EP004: Organic Matter																	
Organic Matter			0.5	%		<0.5		0.8		<0.5		0.8		0.7			
Total Organic Carbon			0.5	%		<0.5		<0.5		<0.5		<0.5		<0.5			



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)		Client sample ID		Client sampling date / time		TP03_0.2-0.3		TP03_0.4-0.6		TP03_0.7-0.8		TP04_0.2-0.3		TP04_0.5-0.6	
Compound	CAS Number	LOR	Unit	Result	EB1807967-006	EB1807967-007	EB1807967-008	EB1807967-009	EB1807967-010	Result	Result	Result	Result	Result	Result
EA002 : pH (Soils)															
pH Value	----	0.1	pH Unit	6.8	7.3	7.4	6.0	7.8							
EA006: Sodium Adsorption Ratio (SAR)															
Sodium Adsorption Ratio	----	0.01	-	12.4	28.6	29.9	0.49	1.42							
EA010: Conductivity															
Electrical Conductivity @ 25°C	----	1	µS/cm	564	2250	3130	11	48							
EA055: Moisture Content (Dried @ 105-110°C)															
Moisture Content	----	1.0	%	3.2	5.1	6.7	1.9	4.0							
EA058: Emerson Aggregate Test															
Color (Munsell)	----	-	-	-----	-----	-----	Red	-----							
Texture	----	-	-	-----	-----	-----	Sandy Clay Loam	-----							
Emerson Class Number	EC/TC	-	-	-----	-----	-----	3	-----							
EA150: Particle Sizing															
+75µm	----	1	%	-----	-----	-----	46	-----							
+150µm	----	1	%	-----	-----	-----	38	-----							
+300µm	----	1	%	-----	-----	-----	29	-----							
+425µm	----	1	%	-----	-----	-----	24	-----							
+600µm	----	1	%	-----	-----	-----	18	-----							
+1180µm	----	1	%	-----	-----	-----	9	-----							
+2.36mm	----	1	%	-----	-----	-----	3	-----							
+4.75mm	----	1	%	-----	-----	-----	1	-----							
+9.5mm	----	1	%	-----	-----	-----	<1	-----							
+19.0mm	----	1	%	-----	-----	-----	<1	-----							
+37.5mm	----	1	%	-----	-----	-----	<1	-----							
+75.0mm	----	1	%	-----	-----	-----	<1	-----							
EA150: Soil Classification based on Particle Size															
Clay (<2 µm)	----	1	%	-----	-----	-----	38	-----							
Silt (2-60 µm)	----	1	%	-----	-----	-----	14	-----							
Sand (0.06-2.00 mm)	----	1	%	-----	-----	-----	43	-----							
Gravel (>2mm)	----	1	%	-----	-----	-----	5	-----							
Cobbles (>6cm)	----	1	%	-----	-----	-----	<1	-----							
EA152: Soil Particle Density															
Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3	-----	-----	-----	2.45	-----							
ED006: Exchangeable Cations on Alkaline Soils															
Exchangeable Calcium	----	0.2	meq/100g	-----	-----	-----	5.1	-----							3.5



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)		Client sample ID													
		Client sampling date / time				TP03_0.2-0.3		TP03_0.4-0.6		TP03_0.7-0.8		TP04_0.2-0.3		TP04_0.5-0.6	
Compound	CAS Number	LOR	Unit	Result	EB1807967-006	EB1807967-007	EB1807967-008	EB1807967-009	EB1807967-010	Result	Result	Result	Result	Result	Result
ED006: Exchangeable Cations on Alkaline Soils - Continued															
Exchangeable Magnesium		0.2	meq/100g	----	----	----	8.2	----	----	----	----	----	----	3.5	----
Exchangeable Potassium		0.2	meq/100g	----	----	----	<0.2	----	----	----	----	----	----	0.2	----
Exchangeable Sodium		0.2	meq/100g	----	----	----	3.4	----	----	----	----	----	----	0.2	----
Cation Exchange Capacity		0.2	meq/100g	----	----	----	16.8	----	----	----	----	----	----	7.5	----
Exchangeable Sodium Percent		0.2	%	----	----	----	20.0	----	----	----	----	----	----	3.3	----
ED007: Exchangeable Cations															
Exchangeable Calcium		0.1	meq/100g	----	----	----	----	2.6	----	----	----	----	----	----	----
Exchangeable Magnesium		0.1	meq/100g	----	----	----	----	3.2	----	----	----	----	----	----	----
Exchangeable Potassium		0.1	meq/100g	----	----	----	----	0.6	----	----	----	----	----	----	----
Exchangeable Sodium		0.1	meq/100g	----	----	----	----	<0.1	----	----	----	----	----	----	----
Cation Exchange Capacity		0.1	meq/100g	----	----	----	----	6.5	----	----	----	----	----	----	----
Exchangeable Sodium Percent		0.1	%	----	----	----	----	1.5	----	----	----	----	----	----	----
ED008: Exchangeable Cations															
Exchangeable Calcium		0.1	meq/100g	----	3.4	7.7	----	----	----	----	----	----	----	----	----
Exchangeable Magnesium		0.1	meq/100g	----	3.3	11.2	----	----	----	----	----	----	----	----	----
Exchangeable Potassium		0.1	meq/100g	----	0.2	0.2	----	----	----	----	----	----	----	----	----
Exchangeable Sodium		0.1	meq/100g	----	0.5	2.6	----	----	----	----	----	----	----	----	----
Cation Exchange Capacity		0.1	meq/100g	----	7.5	21.8	----	----	----	----	----	----	----	----	----
Exchangeable Sodium Percent		0.1	%	----	6.7	12.2	----	----	----	----	----	----	----	----	----
ED022 : Acid Extractable Potassium (Skene)															
Acid Extractable K (Skene)		100	mg/kg	----	100	<100	100	200	100	100	200	200	100	100	100
ED040S : Soluble Sulfate by ICPAES															
Sulfate as SO4 2-	14808-79-8	10	mg/kg	----	30	460	1540	10	40	40	40	40	40	40	40
ED042T: Total Sulfur by LECO															
Sulfur - Total as S (LECO)		0.01	%	----	0.03	0.04	0.07	<0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02
ED045G: Chloride by Discrete Analyser															
Chloride	16887-00-6	10	mg/kg	----	850	3570	4470	<10	<10	<10	<10	<10	<10	<10	<10
ED093S: Soluble Major Cations															
Calcium	7440-70-2	10	mg/kg	----	20	150	340	<10	<10	<10	<10	<10	<10	<10	<10
Magnesium	7439-95-4	10	mg/kg	----	10	150	310	<10	<10	<10	<10	<10	<10	<10	<10
Sodium	7440-23-5	10	mg/kg	----	530	2170	2800	<10	<10	<10	<10	<10	<10	40	<10
Potassium	7440-09-7	10	mg/kg	----	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
EK057G: Nitrite as N by Discrete Analyser															
Nitrite as N (Sol.)	14797-65-0	0.1	mg/kg	----	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)		Client sample ID													
		Client sampling date / time													
Compound	CAS Number	LOR	Unit	TP03_0.2-0.3	TP03_0.4-0.6	TP03_0.7-0.8	TP04_0.2-0.3	TP04_0.5-0.6							
				Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	
EK058G: Nitrate as N by Discrete Analyser															
Nitrate as N (Sol.)	14797-55-8	0.1	mg/kg	4.1	3.4	4.5	0.8	5.3							
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser															
Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg	4.1	3.4	4.5	0.8	5.3							
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser															
Total Kjeldahl Nitrogen as N	----	20	mg/kg	230	240	160	210	270							
EK062: Total Nitrogen as N (TKN + NOx)															
^ Total Nitrogen as N	----	20	mg/kg	230	240	160	210	280							
EK067G: Total Phosphorus as P by Discrete Analyser															
Total Phosphorus as P	----	2	mg/kg	874	892	1550	176	153							
EK080: Bicarbonate Extractable Phosphorus (Colwell)															
Bicarbonate Ext. P (Colwell)	----	5	mg/kg	42	11	9	<5	<5							
EP004: Organic Matter															
Organic Matter	----	0.5	%	0.5	0.5	<0.5	<0.5	<0.5							
Total Organic Carbon	----	0.5	%	<0.5	<0.5	<0.5	<0.5	<0.5							



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)		Client sample ID						
		Client sampling date / time						
Compound	CAS Number	LOR	Unit	TP04_0.8-1.0	TP05_0.1-0.3	TP05_0.4-0.6	TP05_0.8-1.0	TP06_0.1-0.3
				22-Mar-2018 00:00	22-Mar-2018 00:00	22-Mar-2018 00:00	22-Mar-2018 00:00	22-Mar-2018 00:00
				EB1807967-011	EB1807967-012	EB1807967-013	EB1807967-014	EB1807967-015
				Result	Result	Result	Result	Result
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	8.9	6.7	6.8	8.3	6.2
EA006: Sodium Adsorption Ratio (SAR)								
Sodium Adsorption Ratio	----	0.01	-	5.49	0.47	3.26	8.69	0.14
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	172	24	575	1180	9
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	3.0	2.2	4.8	7.4	2.5
EA058: Emerson Aggregate Test								
Color (Munsell)	----	-	-	----	Red	----	----	----
Texture	----	-	-	----	Sandy Clay Loam	----	----	----
Emerson Class Number	EC/TC	-	-	----	3	----	----	----
EA150: Particle Sizing								
+75µm	----	1	%	----	65	----	----	----
+150µm	----	1	%	----	53	----	----	----
+300µm	----	1	%	----	46	----	----	----
+425µm	----	1	%	----	45	----	----	----
+600µm	----	1	%	----	43	----	----	----
+1180µm	----	1	%	----	42	----	----	----
+2.36mm	----	1	%	----	40	----	----	----
+4.75mm	----	1	%	----	36	----	----	----
+9.5mm	----	1	%	----	20	----	----	----
+19.0mm	----	1	%	----	<1	----	----	----
+37.5mm	----	1	%	----	<1	----	----	----
+75.0mm	----	1	%	----	<1	----	----	----
EA150: Soil Classification based on Particle Size								
Clay (<2 µm)	----	1	%	----	14	----	----	----
Silt (2-60 µm)	----	1	%	----	14	----	----	----
Sand (0.06-2.00 mm)	----	1	%	----	32	----	----	----
Gravel (>2mm)	----	1	%	----	40	----	----	----
Cobbles (>6cm)	----	1	%	----	<1	----	----	----
EA152: Soil Particle Density								
Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3	----	2.38	----	----	----
ED006: Exchangeable Cations on Alkaline Soils								
Exchangeable Calcium	----	0.2	meq/100g	3.2	----	----	7.9	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)		Client sample ID		TP06_0.1-0.3			
		Client sampling date / time		TP05_0.8-1.0			
Compound	CAS Number	LOR	Unit	TP05_0.1-0.3	TP05_0.4-0.6	TP05_0.8-1.0	TP06_0.1-0.3
				Result	Result	Result	Result
ED006: Exchangeable Cations on Alkaline Soils - Continued							
Exchangeable Magnesium	----	0.2	meq/100g	2.9	-----	6.7	----
Exchangeable Potassium	----	0.2	meq/100g	<0.2	-----	0.2	----
Exchangeable Sodium	----	0.2	meq/100g	0.4	-----	1.1	----
Cation Exchange Capacity	----	0.2	meq/100g	6.5	-----	15.9	----
Exchangeable Sodium Percent	----	0.2	%	5.6	-----	6.7	----
ED007: Exchangeable Cations							
Exchangeable Calcium	----	0.1	meq/100g	4.4	-----	-----	4.9
Exchangeable Magnesium	----	0.1	meq/100g	2.8	-----	-----	2.6
Exchangeable Potassium	----	0.1	meq/100g	0.7	-----	-----	0.4
Exchangeable Sodium	----	0.1	meq/100g	0.1	-----	-----	<0.1
Cation Exchange Capacity	----	0.1	meq/100g	8.1	-----	-----	8.0
Exchangeable Sodium Percent	----	0.1	%	1.4	-----	-----	0.3
ED008: Exchangeable Cations							
Exchangeable Calcium	----	0.1	meq/100g	13.4	-----	-----	-----
Exchangeable Magnesium	----	0.1	meq/100g	9.4	-----	-----	-----
Exchangeable Potassium	----	0.1	meq/100g	0.4	-----	-----	-----
Exchangeable Sodium	----	0.1	meq/100g	0.2	-----	-----	-----
Cation Exchange Capacity	----	0.1	meq/100g	23.6	-----	-----	-----
Exchangeable Sodium Percent	----	0.1	%	1.0	-----	-----	-----
ED022 : Acid Extractable Potassium (Skene)							
Acid Extractable K (Skene)	----	100	mg/kg	<100	300	200	100
ED040S : Soluble Sulfate by ICPAES							
Sulfate as SO4 2-	14808-79-8	10	mg/kg	40	<10	70	280
ED042T: Total Sulfur by LECO							
Sulfur - Total as S (LECO)	----	0.01	%	<0.01	0.03	0.04	0.03
ED045G: Chloride by Discrete Analyser							
Chloride	16887-00-6	10	mg/kg	70	20	850	1800
ED093S: Soluble Major Cations							
Calcium	7440-70-2	10	mg/kg	20	<10	170	240
Magnesium	7439-95-4	10	mg/kg	10	<10	80	150
Sodium	7440-23-5	10	mg/kg	140	10	220	780
Potassium	7440-09-7	10	mg/kg	<10	<10	<10	<10
EK057G: Nitrite as N by Discrete Analyser							
Nitrite as N (Sol.)	14797-65-0	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)		Client sample ID												
		Client sampling date / time			TP04_0.8-1.0		TP05_0.1-0.3		TP05_0.4-0.6		TP05_0.8-1.0		TP06_0.1-0.3	
Compound	CAS Number	LOR	Unit	Result	EB1807967-011	EB1807967-012	EB1807967-013	EB1807967-014	EB1807967-015					
EK058G: Nitrate as N by Discrete Analyser														
Nitrate as N (Sol.)	14797-55-8	0.1	mg/kg	14.5	0.4	2.6	3.4	0.4						
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser														
Nitrite + Nitrate as N (Sol.)		0.1	mg/kg	14.5	0.4	2.6	3.4	0.4						
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser														
Total Kjeldahl Nitrogen as N		20	mg/kg	150	290	350	270	330						
EK062: Total Nitrogen as N (TKN + NOx)														
^ Total Nitrogen as N		20	mg/kg	160	290	350	270	330						
EK067G: Total Phosphorus as P by Discrete Analyser														
Total Phosphorus as P		2	mg/kg	195	759	962	1340	2470						
EK080: Bicarbonate Extractable Phosphorus (Colwell)														
Bicarbonate Ext. P (Colwell)		5	mg/kg	<5	35	11	8	98						
EP004: Organic Matter														
Organic Matter		0.5	%	<0.5	<0.5	<0.5	<0.5	0.5						
Total Organic Carbon		0.5	%	<0.5	<0.5	<0.5	<0.5	<0.5						



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)		Client sample ID			
		Client sampling date / time			
Compound	CAS Number	LOR	Unit	TP06_0.4-0.6	TP07_0.4-0.6
				22-Mar-2018 00:00	21-Mar-2018 00:00
				EB1807967-016	EB1807967-019
					EB1807967-020
EA002 : pH (Soils)					
pH Value		0.1	pH Unit	6.5	7.0
EA006: Sodium Adsorption Ratio (SAR)					
Sodium Adsorption Ratio		0.01	-	2.78	1.28
EA010: Conductivity					
Electrical Conductivity @ 25°C		1	µS/cm	277	70
EA055: Moisture Content (Dried @ 105-110°C)					
Moisture Content		1.0	%	5.5	5.0
EA058: Emerson Aggregate Test					
Color (Munsell)		-	-		Red
Texture		-	-		Sandy Clay Loam
Emerson Class Number	EC/TC	-	-		3
EA150: Particle Sizing					
+75µm		1	%		68
+150µm		1	%		66
+300µm		1	%		65
+425µm		1	%		65
+600µm		1	%		65
+1180µm		1	%		64
+2.36mm		1	%		62
+4.75mm		1	%		48
+9.5mm		1	%		20
+19.0mm		1	%		<1
+37.5mm		1	%		<1
+75.0mm		1	%		<1
EA150: Soil Classification based on Particle Size					
Clay (<2 µm)		1	%		17
Silt (2-60 µm)		1	%		12
Sand (0.06-2.00 mm)		1	%		9
Gravel (>2mm)		1	%		62
Cobbles (>6cm)		1	%		<1
EA152: Soil Particle Density					
Soil Particle Density (Clay/Silt/Sand)		0.01	g/cm3		2.42
ED006: Exchangeable Cations on Alkaline Soils					
Exchangeable Calcium		0.2	meq/100g		9.6



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)		Client sample ID				TP06_0.4-0.6	TP06_0.8-0.95	TP07_0.2-0.3	TP07_0.4-0.6	TP07_0.7-0.9
		Client sampling date / time				22-Mar-2018 00:00	22-Mar-2018 00:00	21-Mar-2018 00:00	21-Mar-2018 00:00	21-Mar-2018 00:00
Compound	CAS Number	LOR	Unit	Result	EB1807967-016	EB1807967-017	EB1807967-018	EB1807967-019	EB1807967-020	
ED006: Exchangeable Cations on Alkaline Soils - Continued										
Exchangeable Magnesium	----	0.2	meq/100g	----	4.6	----	----	----	3.8	
Exchangeable Potassium	----	0.2	meq/100g	----	0.2	----	----	----	<0.2	
Exchangeable Sodium	----	0.2	meq/100g	----	0.5	----	----	----	0.3	
Cation Exchange Capacity	----	0.2	meq/100g	----	9.4	----	----	----	14.0	
Exchangeable Sodium Percent	----	0.2	%	----	5.0	----	----	----	2.5	
ED007: Exchangeable Cations										
Exchangeable Calcium	----	0.1	meq/100g	----	15.0	----	7.8	14.7	----	
Exchangeable Magnesium	----	0.1	meq/100g	----	10.7	----	2.2	5.2	----	
Exchangeable Potassium	----	0.1	meq/100g	----	0.4	----	0.4	0.2	----	
Exchangeable Sodium	----	0.1	meq/100g	----	1.1	----	0.4	0.4	----	
Cation Exchange Capacity	----	0.1	meq/100g	----	27.4	----	10.9	20.6	----	
Exchangeable Sodium Percent	----	0.1	%	----	4.0	----	3.6	1.8	----	
ED022 : Acid Extractable Potassium (Skene)										
Acid Extractable K (Skene)	----	100	mg/kg	----	100	----	200	<100	<100	
ED040S : Soluble Sulfate by ICPAES										
Sulfate as SO4 2-	14808-79-8	10	mg/kg	----	20	350	20	60	90	
ED042T: Total Sulfur by LECO										
Sulfur - Total as S (LECO)	----	0.01	%	----	0.04	0.05	0.06	0.05	0.05	
ED045G: Chloride by Discrete Analyser										
Chloride	16887-00-6	10	mg/kg	----	360	1370	<10	30	410	
ED093S: Soluble Major Cations										
Calcium	7440-70-2	10	mg/kg	----	70	220	<10	20	140	
Magnesium	7439-95-4	10	mg/kg	----	30	170	<10	<10	40	
Sodium	7440-23-5	10	mg/kg	----	120	550	40	40	160	
Potassium	7440-09-7	10	mg/kg	----	<10	<10	<10	<10	<10	
EK057G: Nitrite as N by Discrete Analyser										
Nitrite as N (Sol.)	14797-65-0	0.1	mg/kg	----	<0.1	<0.1	<0.1	<0.1	<0.1	
EK058G: Nitrate as N by Discrete Analyser										
Nitrate as N (Sol.)	14797-55-8	0.1	mg/kg	----	0.8	2.0	7.0	3.4	5.0	
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser										
Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg	----	0.8	2.0	7.0	3.4	5.0	
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser										
Total Kjeldahl Nitrogen as N	----	20	mg/kg	----	430	290	330	510	440	

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)		Client sample ID								
Compound	CAS Number	LOR	Client sampling date / time		Unit	TP06_0.4-0.6	TP06_0.8-0.95	TP07_0.2-0.3	TP07_0.4-0.6	TP07_0.7-0.9
			Result	Result						
EK062: Total Nitrogen as N (TKN + NOx)										
^ Total Nitrogen as N	----	20	mg/kg		430	290	400	510	440	
EK067G: Total Phosphorus as P by Discrete Analyser										
Total Phosphorus as P	----	2	mg/kg		1890	1830	758	828	744	
EK080: Bicarbonate Extractable Phosphorus (Colwell)										
Bicarbonate Ext. P (Colwell)	----	5	mg/kg		87	20	45	20	5	
EP004: Organic Matter										
Organic Matter	----	0.5	%		<0.5	<0.5	0.6	0.7	0.7	
Total Organic Carbon	----	0.5	%		<0.5	<0.5	<0.5	<0.5	<0.5	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)		Client sample ID						
		Client sampling date / time						
Compound	CAS Number	LOR	Unit	TP08_0.1-0.3	TP08_0.5-0.6	TP08_0.7-0.9	TP09_0.1-0.3	TP09_0.4-0.6
				22-Mar-2018 00:00	22-Mar-2018 00:00	22-Mar-2018 00:00	22-Mar-2018 00:00	22-Mar-2018 00:00
				EB1807967-021	EB1807967-022	EB1807967-023	EB1807967-024	EB1807967-025
				Result	Result	Result	Result	Result
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	7.3	7.3	6.4	6.8	7.1
EA006: Sodium Adsorption Ratio (SAR)								
Sodium Adsorption Ratio	----	0.01	-	11.4	6.65	6.62	0.22	0.39
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	366	4400	4550	18	41
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	5.7	7.8	8.8	2.6	4.5
EA058: Emerson Aggregate Test								
Color (Munsell)	----	-	-	----	----	----	Reddish Brown	----
Texture	----	-	-	----	----	----	Sandy Clay Loam	----
Emerson Class Number	EC/TC	-	-	----	----	----	3	----
EA150: Particle Sizing								
+75µm	----	1	%	----	----	----	60	----
+150µm	----	1	%	----	----	----	47	----
+300µm	----	1	%	----	----	----	35	----
+425µm	----	1	%	----	----	----	31	----
+600µm	----	1	%	----	----	----	29	----
+1180µm	----	1	%	----	----	----	27	----
+2.36mm	----	1	%	----	----	----	24	----
+4.75mm	----	1	%	----	----	----	17	----
+9.5mm	----	1	%	----	----	----	8	----
+19.0mm	----	1	%	----	----	----	<1	----
+37.5mm	----	1	%	----	----	----	<1	----
+75.0mm	----	1	%	----	----	----	<1	----
EA150: Soil Classification based on Particle Size								
Clay (<2 µm)	----	1	%	----	----	----	21	----
Silt (2-60 µm)	----	1	%	----	----	----	16	----
Sand (0.06-2.00 mm)	----	1	%	----	----	----	38	----
Gravel (>2mm)	----	1	%	----	----	----	25	----
Cobbles (>6cm)	----	1	%	----	----	----	<1	----
EA152: Soil Particle Density								
Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3	----	----	----	2.36	----
ED006: Exchangeable Cations on Alkaline Soils								
Exchangeable Calcium	----	0.2	meq/100g	8.8	9.5	----	----	----



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)		Client sample ID			Client sampling date / time		TP08_0.1-0.3		TP08_0.5-0.6		TP08_0.7-0.9		TP09_0.1-0.3		TP09_0.4-0.6		
Compound	CAS Number	LOR	Unit	Result		Result		Result		Result		Result		Result			
				EB1807967-021	EB1807967-022	EB1807967-023	EB1807967-024	EB1807967-025									
ED006: Exchangeable Cations on Alkaline Soils - Continued																	
Exchangeable Magnesium	-----	0.2	meq/100g	3.0	2.8	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	
Exchangeable Potassium	-----	0.2	meq/100g	0.3	<0.2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	
Exchangeable Sodium	-----	0.2	meq/100g	1.0	1.2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	
Cation Exchange Capacity	-----	0.2	meq/100g	13.1	13.6	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	
Exchangeable Sodium Percent	-----	0.2	%	7.5	9.0	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	
ED007: Exchangeable Cations																	
Exchangeable Calcium	-----	0.1	meq/100g	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	6.5	-----	13.1	
Exchangeable Magnesium	-----	0.1	meq/100g	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1.8	-----	3.9	
Exchangeable Potassium	-----	0.1	meq/100g	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.4	-----	0.2	
Exchangeable Sodium	-----	0.1	meq/100g	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	<0.1	-----	0.1	
Cation Exchange Capacity	-----	0.1	meq/100g	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	8.7	-----	17.4	
Exchangeable Sodium Percent	-----	0.1	%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.6	-----	0.6	
ED008: Exchangeable Cations																	
Exchangeable Calcium	-----	0.1	meq/100g	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	
Exchangeable Magnesium	-----	0.1	meq/100g	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	
Exchangeable Potassium	-----	0.1	meq/100g	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	
Exchangeable Sodium	-----	0.1	meq/100g	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	
Cation Exchange Capacity	-----	0.1	meq/100g	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	
Exchangeable Sodium Percent	-----	0.1	%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	
ED022 : Acid Extractable Potassium (Skene)																	
Acid Extractable K (Skene)	-----	100	mg/kg	200	100	-----	-----	-----	-----	-----	-----	-----	-----	200	-----	<100	
ED040S : Soluble Sulfate by ICPAES																	
Sulfate as SO4 2-	14808-79-8	10	mg/kg	80	10200	-----	-----	-----	-----	-----	-----	-----	-----	<10	-----	10	
ED042T: Total Sulfur by LECO																	
Sulfur - Total as S (LECO)	-----	0.01	%	0.02	1.28	-----	-----	-----	-----	-----	-----	-----	-----	0.11	-----	0.07	
ED045G: Chloride by Discrete Analyser																	
Chloride	16887-00-6	10	mg/kg	450	3570	-----	-----	-----	-----	-----	-----	-----	-----	<10	-----	30	
ED093S: Soluble Major Cations																	
Calcium	7440-70-2	10	mg/kg	30	3460	-----	-----	-----	-----	-----	-----	-----	-----	<10	-----	20	
Magnesium	7439-95-4	10	mg/kg	<10	420	-----	-----	-----	-----	-----	-----	-----	-----	<10	-----	<10	
Sodium	7440-23-5	10	mg/kg	320	2220	-----	-----	-----	-----	-----	-----	-----	-----	<10	-----	<10	
Potassium	7440-09-7	10	mg/kg	<10	10	-----	-----	-----	-----	-----	-----	-----	-----	<10	-----	<10	
EK057G: Nitrite as N by Discrete Analyser																	
Nitrite as N (Sol.)	14797-65-0	0.1	mg/kg	0.2	<0.1	-----	-----	-----	-----	-----	-----	-----	-----	0.1	-----	<0.1	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)		Client sample ID											
		Client sampling date / time											
Compound	CAS Number	LOR	Unit	TP08_0.1-0.3		TP08_0.5-0.6		TP08_0.7-0.9		TP09_0.1-0.3		TP09_0.4-0.6	
				22-Mar-2018 00:00	EB1807967-021	22-Mar-2018 00:00	EB1807967-022	22-Mar-2018 00:00	EB1807967-023	22-Mar-2018 00:00	EB1807967-024	22-Mar-2018 00:00	EB1807967-025
				Result		Result		Result		Result		Result	
EK058G: Nitrate as N by Discrete Analyser													
Nitrate as N (Sol.)	14797-55-8	0.1	mg/kg		2.2		3.2		1.4		0.9		0.8
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser													
Nitrite + Nitrate as N (Sol.)	-----	0.1	mg/kg		2.4		3.2		1.4		1.0		0.8
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser													
Total Kjeldahl Nitrogen as N	-----	20	mg/kg		320		280		70		380		300
EK062: Total Nitrogen as N (TKN + NOx)													
^ Total Nitrogen as N	-----	20	mg/kg		320		280		70		380		300
EK067G: Total Phosphorus as P by Discrete Analyser													
Total Phosphorus as P	-----	2	mg/kg		142		128		136		24300		24700
EK080: Bicarbonate Extractable Phosphorus (Colwell)													
Bicarbonate Ext. P (Colwell)	-----	5	mg/kg		<5		<5		<5		81		251
EP004: Organic Matter													
Organic Matter	-----	0.5	%		0.8		0.5		<0.5		0.8		0.7
Total Organic Carbon	-----	0.5	%		<0.5		<0.5		<0.5		<0.5		<0.5



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)		Client sample ID					
Compound	CAS Number	Client sampling date / time		TP09_0.7-0.8 22-Mar-2018 00:00 EB1807967-026 Result	TP10_0.1-0.3 22-Mar-2018 00:00 EB1807967-027 Result	TP10_0.5-0.6 22-Mar-2018 00:00 EB1807967-028 Result	TP10_0.8-1.0 22-Mar-2018 00:00 EB1807967-029 Result
		LOR	Unit				
EA002 : pH (Soils)							
pH Value		0.1	pH Unit	7.1	6.6	7.1	7.8
EA006: Sodium Adsorption Ratio (SAR)							
Sodium Adsorption Ratio		0.01	-	0.23	0.32	0.65	1.15
EA010: Conductivity							
Electrical Conductivity @ 25°C		1	µS/cm	35	22	77	69
EA055: Moisture Content (Dried @ 105-110°C)							
Moisture Content		1.0	%	3.2	1.8	5.8	4.0
EA058: Emerson Aggregate Test							
Color (Munsell)		-	-			Red	
Texture		-	-			Sandy Clay Loam	
Emerson Class Number	EC/TC	-	-			4	
EA150: Particle Sizing							
+75µm		1	%			48	
+150µm		1	%			43	
+300µm		1	%			41	
+425µm		1	%			40	
+600µm		1	%			40	
+1180µm		1	%			39	
+2.36mm		1	%			35	
+4.75mm		1	%			23	
+9.5mm		1	%			5	
+19.0mm		1	%			<1	
+37.5mm		1	%			<1	
+75.0mm		1	%			<1	
EA150: Soil Classification based on Particle Size							
Clay (<2 µm)		1	%			32	
Silt (2-60 µm)		1	%			16	
Sand (0.06-2.00 mm)		1	%			16	
Gravel (>2mm)		1	%			36	
Cobbles (>6cm)		1	%			<1	
EA152: Soil Particle Density							
Soil Particle Density (Clay/Silt/Sand)		0.01	g/cm3			2.35	
ED006: Exchangeable Cations on Alkaline Soils							
Exchangeable Calcium		0.2	meq/100g				8.9



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)		Client sample ID					
		Client sampling date / time					
Compound	CAS Number	LOR	Unit	TP09_0.7-0.8	TP10_0.1-0.3	TP10_0.5-0.6	TP10_0.8-1.0
				22-Mar-2018 00:00	22-Mar-2018 00:00	22-Mar-2018 00:00	22-Mar-2018 00:00
				EB1807967-026	EB1807967-027	EB1807967-028	EB1807967-029
				Result	Result	Result	Result
ED006: Exchangeable Cations on Alkaline Soils - Continued							
Exchangeable Magnesium		0.2	meq/100g	-----	-----	-----	3.3
Exchangeable Potassium		0.2	meq/100g	-----	-----	-----	<0.2
Exchangeable Sodium		0.2	meq/100g	-----	-----	-----	<0.2
Cation Exchange Capacity		0.2	meq/100g	-----	-----	-----	12.3
Exchangeable Sodium Percent		0.2	%	-----	-----	-----	<0.2
ED007: Exchangeable Cations							
Exchangeable Calcium		0.1	meq/100g	6.8	7.9	18.4	-----
Exchangeable Magnesium		0.1	meq/100g	1.9	2.6	7.0	-----
Exchangeable Potassium		0.1	meq/100g	0.4	0.4	0.3	-----
Exchangeable Sodium		0.1	meq/100g	<0.1	<0.1	0.2	-----
Cation Exchange Capacity		0.1	meq/100g	9.2	11.0	26.0	-----
Exchangeable Sodium Percent		0.1	%	0.6	0.6	1.0	-----
ED022 : Acid Extractable Potassium (Skene)							
Acid Extractable K (Skene)		100	mg/kg	200	200	100	-----
ED040S : Soluble Sulfate by ICPAES							
Sulfate as SO4 2-	14808-79-8	10	mg/kg	<10	<10	40	20
ED042T: Total Sulfur by LECO							
Sulfur - Total as S (LECO)		0.01	%	0.17	0.03	0.03	0.05
ED045G: Chloride by Discrete Analyser							
Chloride	16887-00-6	10	mg/kg	20	<10	40	30
ED093S: Soluble Major Cations							
Calcium	7440-70-2	10	mg/kg	10	<10	30	20
Magnesium	7439-95-4	10	mg/kg	<10	<10	<10	<10
Sodium	7440-23-5	10	mg/kg	10	<10	20	30
Potassium	7440-09-7	10	mg/kg	<10	<10	<10	<10
EK057G: Nitrite as N by Discrete Analyser							
Nitrite as N (Sol.)	14797-65-0	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
EK058G: Nitrate as N by Discrete Analyser							
Nitrate as N (Sol.)	14797-55-8	0.1	mg/kg	0.7	1.9	9.7	5.2
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg	0.7	1.9	9.7	5.2
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser							
Total Kjeldahl Nitrogen as N	----	20	mg/kg	360	360	730	400



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)		Client sample ID				Client sampling date / time		Client sample ID		Client sampling date / time		Client sample ID		Client sampling date / time	
Compound	CAS Number	LOI	Unit	TP09_0.7-0.8	TP10_0.1-0.3	TP10_0.5-0.6	TP10_0.8-1.0	TP09_0.7-0.8	TP10_0.1-0.3	TP10_0.5-0.6	TP10_0.8-1.0	TP09_0.7-0.8	TP10_0.1-0.3	TP10_0.5-0.6	TP10_0.8-1.0
EKO62: Total Nitrogen as N (TKN + NOx)															
^ Total Nitrogen as N	----	20	mg/kg	360	360	740	400	360	360	740	400	360	360	740	400
EKO67G: Total Phosphorus as P by Discrete Analyser															
Total Phosphorus as P	----	2	mg/kg	16900	3820	2880	4150	16900	3820	2880	4150	16900	3820	2880	4150
EKO80: Bicarbonate Extractable Phosphorus (Colwell)															
Bicarbonate Ext. P (Colwell)	----	5	mg/kg	81	265	93	34	81	265	93	34	81	265	93	34
EP004: Organic Matter															
Organic Matter	----	0.5	%	0.8	0.6	1.0	0.5	0.8	0.6	1.0	0.5	0.8	0.6	1.0	0.5
Total Organic Carbon	----	0.5	%	<0.5	<0.5	0.6	<0.5	<0.5	<0.5	0.6	<0.5	<0.5	<0.5	0.6	<0.5



Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EB1807967	Page	: 1 of 16
Client	: GOLDER ASSOCIATES	Laboratory	: Environmental Division Brisbane
Contact	: MR STUART SMITH	Telephone	: +61-7-3243 7222
Project	: 1782517	Date Samples Received	: 28-Mar-2018
Site	: Dajarra	Issue Date	: 10-Apr-2018
Sampler	: STUART SMITH	No. of samples received	: 29
Order number	: 1782517	No. of samples analysed	: 29

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- NO Method Blank value outliers occur.
- NO Laboratory Control outliers occur.
- NO Matrix Spike outliers occur.
- Duplicate outliers exist - please see following pages for full details.
- For all regular sample matrices, NO surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- NO Quality Control Sample Frequency Outliers exist.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: SOIL						
Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Limit	Comment
Duplicate (DUP) RPDs						
ED040S: Soluble Major Anions	EB1807967--001	TP01_0.1-0.3	Sulfate as SO4 2- Sodium	14808-79-8	0% - 20%	RPD exceeds LOR based limits
ED093S: Soluble Major Cations	EB1807967--021	TP08_0.1-0.3		7440-23-5	20.9 %	RPD exceeds LOR based limits

Matrix: SOIL

Method		Extraction / Preparation				Analysis	
Container / Client Sample ID(s)		Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA002 : pH (Soils)							
Snap Lock Bag							
TP07_0.2-0.3, TP07_0.7-0.9	TP07_0.4-0.6,	04-Apr-2018	28-Mar-2018	7			
Snap Lock Bag							
TP01_0.1-0.3, TP01_0.8-1.0, TP02_0.3-0.55, TP03_0.4-0.6, TP04_0.2-0.3, TP04_0.8-1.0, TP05_0.4-0.6, TP06_0.1-0.3, TP06_0.8-0.95, TP08_0.5-0.6, TP09_0.1-0.3, TP09_0.7-0.8, TP10_0.5-0.6,	TP01_0.4-0.6, TP02_0.1-0.25, TP03_0.2-0.3, TP03_0.7-0.8, TP04_0.5-0.6, TP05_0.1-0.3, TP05_0.8-1.0, TP06_0.4-0.6, TP08_0.1-0.3, TP08_0.7-0.9, TP09_0.4-0.6, TP10_0.1-0.3, TP10_0.8-1.0	04-Apr-2018	29-Mar-2018	6			
EA010: Conductivity							
Snap Lock Bag							
TP07_0.2-0.3, TP07_0.7-0.9	TP07_0.4-0.6,	04-Apr-2018	28-Mar-2018	7			



Matrix: **SOIL**

Method				
Container / Client Sample ID(s)	Extraction / Preparation		Analysis	
	Date extracted	Due for extraction	Date analysed	Due for analysis
Days overdue				
Days overdue				
EA010: Conductivity - Analysis Holding Time Compliance				
Snap Lock Bag TP01_0.1-0.3, TP01_0.8-1.0, TP02_0.3-0.55, TP03_0.4-0.6, TP04_0.2-0.3, TP04_0.8-1.0, TP05_0.4-0.6, TP06_0.1-0.3, TP06_0.8-0.95, TP08_0.5-0.6, TP09_0.1-0.3, TP09_0.7-0.8, TP10_0.5-0.6, TP10_0.8-1.0	04-Apr-2018	29-Mar-2018		6
EP004: Organic Matter	06-Apr-2018	28-Mar-2018		9

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for VOC in soils vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.



Matrix: **SOIL** Evaluation: * = Holding time breach ; ✓ = Within holding time.

Method		Sample Date	Extraction / Preparation		Evaluation	Analysis									
Container / Client Sample ID(s)	Date extracted		Due for extraction	Date analysed		Due for analysis	Evaluation								
EA002 : pH (Soils)															
Snap Lock Bag (EA002)		21-Mar-2018	04-Apr-2018	28-Mar-2018	✖	04-Apr-2018	04-Apr-2018	✔							
TP07_0.2-0.3, TP07_0.7-0.9															
Snap Lock Bag (EA002)		22-Mar-2018	04-Apr-2018	29-Mar-2018	✖	04-Apr-2018	04-Apr-2018	✔							
TP01_0.1-0.3, TP01_0.8-1.0, TP02_0.3-0.55, TP03_0.4-0.6, TP04_0.2-0.3, TP04_0.8-1.0, TP05_0.4-0.6, TP06_0.1-0.3, TP06_0.8-0.95, TP08_0.5-0.6, TP09_0.1-0.3, TP09_0.7-0.8, TP10_0.5-0.6,															
TP07_0.4-0.6, TP01_0.4-0.6, TP02_0.1-0.25, TP03_0.2-0.3, TP03_0.7-0.8, TP04_0.5-0.6, TP05_0.1-0.3, TP05_0.8-1.0, TP06_0.4-0.6, TP08_0.1-0.3, TP08_0.7-0.9, TP09_0.4-0.6, TP10_0.1-0.3, TP10_0.8-1.0															
EA006: Sodium Adsorption Ratio (SAR)															
Snap Lock Bag (EA006)									21-Mar-2018	05-Apr-2018	17-Sep-2018	✔	06-Apr-2018	17-Sep-2018	✔
TP07_0.2-0.3, TP07_0.7-0.9															
Snap Lock Bag (EA006)									22-Mar-2018	05-Apr-2018	18-Sep-2018	✔	06-Apr-2018	18-Sep-2018	✔
TP01_0.1-0.3, TP01_0.8-1.0, TP02_0.3-0.55, TP03_0.4-0.6, TP04_0.2-0.3, TP04_0.8-1.0, TP05_0.4-0.6, TP06_0.1-0.3, TP06_0.8-0.95, TP08_0.5-0.6, TP09_0.1-0.3, TP09_0.7-0.8, TP10_0.5-0.6,															
TP07_0.4-0.6, TP01_0.4-0.6, TP02_0.1-0.25, TP03_0.2-0.3, TP03_0.7-0.8, TP04_0.5-0.6, TP05_0.1-0.3, TP05_0.8-1.0, TP06_0.4-0.6, TP08_0.1-0.3, TP08_0.7-0.9, TP09_0.4-0.6, TP10_0.1-0.3, TP10_0.8-1.0															



Matrix: **SOIL** Evaluation: * = Holding time breach ; ✓ = Within holding time.

Method		Sample Date	Extraction / Preparation		Evaluation	Analysis		
Container / Client Sample ID(s)	Date extracted		Due for extraction	Date analysed		Due for analysis	Evaluation	
EA010: Conductivity								
Snap Lock Bag (EA010)	TP07_0.2-0.3, TP07_0.7-0.9	21-Mar-2018	04-Apr-2018	28-Mar-2018	✗	04-Apr-2018	02-May-2018	✓
	TP01_0.4-0.6, TP02_0.1-0.25, TP03_0.2-0.3, TP03_0.7-0.8, TP04_0.5-0.6, TP05_0.1-0.3, TP05_0.8-1.0, TP06_0.4-0.6, TP08_0.1-0.3, TP08_0.7-0.9, TP09_0.4-0.6, TP10_0.1-0.3, TP10_0.8-1.0	22-Mar-2018	04-Apr-2018	29-Mar-2018	✗	04-Apr-2018	02-May-2018	✓
EA055: Moisture Content (Dried @ 105-110°C)								
Snap Lock Bag (EA055)	TP07_0.2-0.3, TP07_0.7-0.9	21-Mar-2018	04-Apr-2018	28-Mar-2018	---	03-Apr-2018	04-Apr-2018	✓
	TP01_0.4-0.6, TP02_0.1-0.25, TP03_0.2-0.3, TP03_0.7-0.8, TP04_0.5-0.6, TP05_0.1-0.3, TP05_0.8-1.0, TP06_0.4-0.6, TP08_0.1-0.3, TP08_0.7-0.9, TP09_0.4-0.6, TP10_0.1-0.3, TP10_0.8-1.0	22-Mar-2018	04-Apr-2018	29-Mar-2018	---	03-Apr-2018	05-Apr-2018	✓



Matrix: **SOIL** Evaluation: * = Holding time breach ; ✓ = Within holding time.

Method		Sample Date	Extraction / Preparation		Analysis	
Container / Client Sample ID(s)	Date extracted		Due for extraction	Evaluation	Date analysed	Due for analysis
EA058: Emerson Aggregate Test						
Snap Lock Bag (EA058) TP07_0.4-0.6		21-Mar-2018	-----	-----	04-Apr-2018	17-Sep-2018
Snap Lock Bag (EA058) TP01_0.1-0.3, TP02_0.3-0.55, TP05_0.1-0.3, TP10_0.5-0.6	TP02_0.1-0.25, TP04_0.2-0.3, TP09_0.1-0.3,	22-Mar-2018	-----	-----	04-Apr-2018	18-Sep-2018
EA150: Particle Sizing						
Snap Lock Bag (EA150H) TP07_0.4-0.6		21-Mar-2018	-----	-----	09-Apr-2018	17-Sep-2018
Snap Lock Bag (EA150H) TP01_0.1-0.3, TP02_0.3-0.55, TP05_0.1-0.3, TP10_0.5-0.6	TP02_0.1-0.25, TP04_0.2-0.3, TP09_0.1-0.3,	22-Mar-2018	-----	-----	09-Apr-2018	18-Sep-2018
EA150: Soil Classification based on Particle Size						
Snap Lock Bag (EA150H) TP07_0.4-0.6		21-Mar-2018	-----	-----	09-Apr-2018	17-Sep-2018
Snap Lock Bag (EA150H) TP01_0.1-0.3, TP02_0.3-0.55, TP05_0.1-0.3, TP10_0.5-0.6	TP02_0.1-0.25, TP04_0.2-0.3, TP09_0.1-0.3,	22-Mar-2018	-----	-----	09-Apr-2018	18-Sep-2018
EA152: Soil Particle Density						
Snap Lock Bag (EA152) TP07_0.4-0.6		21-Mar-2018	-----	-----	09-Apr-2018	17-Sep-2018
Snap Lock Bag (EA152) TP01_0.1-0.3, TP02_0.3-0.55, TP05_0.1-0.3, TP10_0.5-0.6	TP02_0.1-0.25, TP04_0.2-0.3, TP09_0.1-0.3,	22-Mar-2018	-----	-----	09-Apr-2018	18-Sep-2018
ED006: Exchangeable Cations on Alkaline Soils						
Pulp Bag (ED006) TP07_0.7-0.9		21-Mar-2018	06-Apr-2018	18-Apr-2018	✓	18-Apr-2018
Pulp Bag (ED006) TP01_0.1-0.3, TP01_0.8-1.0, TP03_0.7-0.8, TP04_0.8-1.0, TP06_0.8-0.95, TP08_0.5-0.6,	TP01_0.4-0.6, TP02_0.3-0.55, TP04_0.5-0.6, TP05_0.8-1.0, TP08_0.1-0.3, TP10_0.8-1.0,	22-Mar-2018	06-Apr-2018	19-Apr-2018	✓	19-Apr-2018



Matrix: **SOIL** Evaluation: * = Holding time breach ; ✓ = Within holding time.

Method		Sample Date	Extraction / Preparation		Analysis		
Container / Client Sample ID(s)	Date extracted		Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED007: Exchangeable Cations							
Pulp Bag (ED007)	TP07_0.2-0.3,	21-Mar-2018	06-Apr-2018	18-Apr-2018	06-Apr-2018	18-Apr-2018	✓
Pulp Bag (ED007)	TP04_0.2-0.3, TP06_0.1-0.3, TP09_0.1-0.3, TP09_0.4-0.6, TP10_0.1-0.3,	22-Mar-2018	06-Apr-2018	19-Apr-2018	06-Apr-2018	19-Apr-2018	✓
ED008: Exchangeable Cations							
Pulp Bag (ED008)	TP03_0.4-0.6, TP08_0.7-0.9	22-Mar-2018	06-Apr-2018	19-Apr-2018	09-Apr-2018	19-Apr-2018	✓
ED022 : Acid Extractable Potassium (Skene)							
Snap Lock Bag (ED022)	TP07_0.2-0.3, TP07_0.7-0.9	21-Mar-2018	----	----	03-Apr-2018	17-Sep-2018	✓
Snap Lock Bag (ED022)	TP01_0.1-0.3, TP01_0.8-1.0, TP02_0.3-0.55, TP03_0.4-0.6, TP04_0.2-0.3, TP04_0.8-1.0, TP05_0.4-0.6, TP06_0.1-0.3, TP06_0.8-0.95, TP08_0.5-0.6, TP09_0.1-0.3, TP09_0.7-0.8, TP10_0.5-0.6,	22-Mar-2018	----	----	03-Apr-2018	18-Sep-2018	✓



Matrix: **SOIL** Evaluation: * = Holding time breach ; ✓ = Within holding time.

Method		Sample Date	Extraction / Preparation		Analysis			
Container / Client Sample ID(s)	Date extracted		Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
ED040S : Soluble Sulfate by ICPAES								
Snap Lock Bag (ED040S)		TP07_0.2-0.3, TP07_0.7-0.9	21-Mar-2018	04-Apr-2018	18-Apr-2018	06-Apr-2018	02-May-2018	✓
Snap Lock Bag (ED040S)		TP01_0.4-0.6, TP02_0.1-0.25, TP03_0.2-0.3, TP03_0.7-0.8, TP04_0.5-0.6, TP05_0.1-0.3, TP05_0.8-1.0, TP06_0.4-0.6, TP08_0.1-0.3, TP08_0.7-0.9, TP09_0.4-0.6, TP10_0.1-0.3, TP10_0.5-0.6,	22-Mar-2018	04-Apr-2018	19-Apr-2018	06-Apr-2018	02-May-2018	✓
ED042T: Total Sulfur by LECO								
Pulp Bag (ED042T)		TP07_0.2-0.3, TP07_0.7-0.9	21-Mar-2018	06-Apr-2018	18-Apr-2018	06-Apr-2018	18-Apr-2018	✓
Pulp Bag (ED042T)		TP01_0.4-0.6, TP02_0.1-0.25, TP03_0.2-0.3, TP03_0.7-0.8, TP04_0.5-0.6, TP05_0.1-0.3, TP05_0.8-1.0, TP06_0.4-0.6, TP08_0.1-0.3, TP08_0.7-0.9, TP09_0.4-0.6, TP10_0.1-0.3, TP10_0.5-0.6,	22-Mar-2018	06-Apr-2018	19-Apr-2018	06-Apr-2018	19-Apr-2018	✓



Matrix: **SOIL** Evaluation: * = Holding time breach ; ✓ = Within holding time.

Method		Sample Date	Extraction / Preparation		Analysis	
Container / Client Sample ID(s)			Date extracted	Due for extraction	Date analysed	Due for analysis
ED045G: Chloride by Discrete Analyser						
Snap Lock Bag (ED045G)	TP07_0.2-0.3,	21-Mar-2018	04-Apr-2018	18-Apr-2018	✓	06-Apr-2018
	TP07_0.7-0.9					
	TP07_0.4-0.6,					
Snap Lock Bag (ED045G)	TP01_0.1-0.3,	22-Mar-2018	04-Apr-2018	19-Apr-2018	✓	06-Apr-2018
	TP01_0.8-1.0,					
	TP02_0.3-0.55,					
	TP03_0.2-0.3,					
	TP03_0.7-0.8,					
	TP04_0.5-0.6,					
	TP05_0.1-0.3,					
	TP05_0.8-1.0,					
	TP06_0.4-0.6,					
	TP06_0.1-0.3,					
	TP08_0.8-0.95,					
ED093S: Soluble Major Cations	TP08_0.5-0.6,	21-Mar-2018	04-Apr-2018	17-Sep-2018	✓	06-Apr-2018
	TP09_0.1-0.3,					
	TP09_0.4-0.6,					
	TP09_0.7-0.8,					
	TP10_0.1-0.3,					
	TP10_0.8-1.0					
	TP10_0.5-0.6,					
Snap Lock Bag (ED093S)	TP07_0.2-0.3,	21-Mar-2018	04-Apr-2018	17-Sep-2018	✓	06-Apr-2018
	TP07_0.7-0.9					
	TP07_0.4-0.6,					
Snap Lock Bag (ED093S)	TP01_0.1-0.3,	22-Mar-2018	04-Apr-2018	18-Sep-2018	✓	06-Apr-2018
	TP01_0.8-1.0,					
	TP02_0.3-0.55,					
	TP03_0.2-0.3,					
	TP03_0.7-0.8,					
	TP04_0.5-0.6,					
	TP05_0.1-0.3,					
	TP05_0.8-1.0,					
	TP06_0.4-0.6,					
	TP06_0.1-0.3,					
	TP06_0.8-0.95,					
ED093S: Soluble Major Cations	TP08_0.1-0.3,	22-Mar-2018	04-Apr-2018	18-Sep-2018	✓	06-Apr-2018
	TP08_0.5-0.6,					
	TP09_0.1-0.3,					
	TP09_0.4-0.6,					
	TP10_0.1-0.3,					
	TP10_0.8-1.0					



Matrix: **SOIL** Evaluation: * = Holding time breach ; ✓ = Within holding time.

Method		Sample Date	Extraction / Preparation		Analysis	
Container / Client Sample ID(s)			Date extracted	Due for extraction	Date analysed	Due for analysis
EK057G: Nitrite as N by Discrete Analyser						
Snap Lock Bag (EK057G)	TP07_0.2-0.3, TP07_0.7-0.9	21-Mar-2018	04-Apr-2018	17-Sep-2018	06-Apr-2018	17-Sep-2018
	TP01_0.4-0.6, TP02_0.1-0.25, TP03_0.2-0.3, TP03_0.7-0.8, TP04_0.5-0.6, TP05_0.1-0.3, TP05_0.8-1.0, TP06_0.4-0.6, TP08_0.1-0.3, TP08_0.7-0.9, TP09_0.4-0.6, TP10_0.1-0.3, TP10_0.5-0.6,	22-Mar-2018	04-Apr-2018	18-Sep-2018	06-Apr-2018	18-Sep-2018
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser						
Snap Lock Bag (EK059G)	TP07_0.2-0.3, TP07_0.7-0.9	21-Mar-2018	04-Apr-2018	17-Sep-2018	06-Apr-2018	17-Sep-2018
	TP01_0.4-0.6, TP02_0.1-0.25, TP03_0.2-0.3, TP03_0.7-0.8, TP04_0.5-0.6, TP05_0.1-0.3, TP05_0.8-1.0, TP06_0.4-0.6, TP08_0.1-0.3, TP08_0.7-0.9, TP09_0.4-0.6, TP10_0.1-0.3, TP10_0.5-0.6,	22-Mar-2018	04-Apr-2018	18-Sep-2018	06-Apr-2018	18-Sep-2018



Matrix: **SOIL** Evaluation: * = Holding time breach ; ✓ = Within holding time.

Method		Sample Date	Extraction / Preparation		Analysis		
Container / Client Sample ID(s)	Date extracted		Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser							
Snap Lock Bag (EK061G)	TP07_0.2-0.3,	21-Mar-2018	03-Apr-2018	17-Sep-2018	✓	17-Sep-2018	✓
	TP07_0.7-0.9						
	TP01_0.4-0.6,						
Snap Lock Bag (EK061G)	TP01_0.1-0.3,	22-Mar-2018	03-Apr-2018	18-Sep-2018	✓	18-Sep-2018	✓
	TP01_0.8-1.0,						
	TP02_0.3-0.55,						
	TP03_0.4-0.6,						
	TP04_0.2-0.3,						
	TP04_0.8-1.0,						
	TP05_0.4-0.6,						
	TP06_0.1-0.3,						
	TP06_0.8-0.95,						
	TP08_0.5-0.6,						
TP09_0.1-0.3,	TP09_0.4-0.6,	TP10_0.1-0.3,	TP10_0.8-1.0				
EK067G: Total Phosphorus as P by Discrete Analyser							
Snap Lock Bag (EK067G)	TP07_0.2-0.3,	21-Mar-2018	03-Apr-2018	17-Sep-2018	✓	17-Sep-2018	✓
	TP07_0.7-0.9						
	TP01_0.4-0.6,						
Snap Lock Bag (EK067G)	TP01_0.1-0.3,	22-Mar-2018	03-Apr-2018	18-Sep-2018	✓	18-Sep-2018	✓
	TP01_0.8-1.0,						
	TP02_0.3-0.55,						
	TP03_0.4-0.6,						
	TP04_0.2-0.3,						
	TP04_0.8-1.0,						
	TP05_0.4-0.6,						
	TP06_0.1-0.3,						
	TP06_0.8-0.95,						
	TP08_0.5-0.6,						
TP09_0.1-0.3,	TP09_0.4-0.6,	TP10_0.1-0.3,	TP10_0.8-1.0				



Matrix: **SOIL** Evaluation: * = Holding time breach ; ✓ = Within holding time.

Method		Sample Date	Extraction / Preparation		Analysis			
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Evaluation	
EK080: Bicarbonate Extractable Phosphorus (Colwell)								
Snap Lock Bag (EK080)		21-Mar-2018	----	----	----	03-Apr-2018	17-Sep-2018	✓
TP07_0.2-0.3, TP07_0.7-0.9								
Snap Lock Bag (EK080)		22-Mar-2018	-----	-----	-----	03-Apr-2018	18-Sep-2018	✓
TP01_0.1-0.3, TP01_0.8-1.0, TP02_0.3-0.55, TP03_0.4-0.6, TP04_0.2-0.3, TP04_0.8-1.0, TP05_0.4-0.6, TP06_0.1-0.3, TP06_0.8-0.95, TP08_0.5-0.6, TP09_0.1-0.3, TP09_0.7-0.8, TP10_0.5-0.6,								
EP004: Organic Matter								
Snap Lock Bag (EP004)		21-Mar-2018	06-Apr-2018	28-Mar-2018	✗	09-Apr-2018	04-May-2018	✓
TP07_0.2-0.3, TP07_0.7-0.9								
Snap Lock Bag (EP004)		22-Mar-2018	06-Apr-2018	29-Mar-2018	✗	09-Apr-2018	04-May-2018	✓
TP01_0.1-0.3, TP01_0.8-1.0, TP02_0.3-0.55, TP03_0.4-0.6, TP04_0.2-0.3, TP04_0.8-1.0, TP05_0.4-0.6, TP06_0.1-0.3, TP06_0.8-0.95, TP08_0.5-0.6, TP09_0.1-0.3, TP09_0.7-0.8, TP10_0.5-0.6,								



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: * = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)		Quality Control Specification	
Analytical Methods		QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Acid extractable K (Skene)	ED022	3	29	10.34	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Bicarbonate Extractable P (Colwell)	EK080	3	29	10.34	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Cations - soluble by ICP-AES	ED093S	3	29	10.34	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride Soluble By Discrete Analyser	ED045G	3	29	10.34	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Electrical Conductivity (1:5)	EA010	3	29	10.34	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	2	12	16.67	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations on Alkaline Soils	ED006	2	13	15.38	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	1	4	25.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Anions - Soluble	ED040S	3	29	10.34	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055	3	29	10.34	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NO _x) - Soluble by Discrete Analyser	EK059G	3	29	10.34	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N - Soluble by Discrete Analyser	EK057G	3	29	10.34	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	3	29	10.34	10.00	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	3	29	10.34	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfur - Total as S (LECO)	ED042T	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TKN as N By Discrete Analyser	EK061G	3	29	10.34	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus By Discrete Analyser	EK067G	3	29	10.34	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Acid extractable K (Skene)	ED022	2	29	6.90	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Bicarbonate Extractable P (Colwell)	EK080	6	29	20.69	15.00	✓	NEPM 2013 B3 & ALS QC Standard
Cations - soluble by ICP-AES	ED093S	2	29	6.90	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride Soluble By Discrete Analyser	ED045G	4	29	13.79	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Electrical Conductivity (1:5)	EA010	2	29	6.90	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	1	12	8.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations on Alkaline Soils	ED006	1	13	7.69	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	1	4	25.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Anions - Soluble	ED040S	2	29	6.90	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NO _x) - Soluble by Discrete Analyser	EK059G	2	29	6.90	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N - Soluble by Discrete Analyser	EK057G	2	29	6.90	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	2	29	6.90	5.00	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	4	29	13.79	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfur - Total as S (LECO)	ED042T	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TKN as N By Discrete Analyser	EK061G	4	29	13.79	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus By Discrete Analyser	EK067G	4	29	13.79	10.00	✓	NEPM 2013 B3 & ALS QC Standard



Matrix: **SOIL** Evaluation: * = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)		Quality Control Specification	
Analytical Methods		QC	Regular	Actual	Expected	Rate (%)	Evaluation
Method Blanks (MB)							
Acid extractable K (Skene)	ED022	2	29	6.90	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Bicarbonate Extractable P (Colwell)	EK080	2	29	6.90	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Cations - soluble by ICP-AES	ED093S	2	29	6.90	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride Soluble By Discrete Analyser	ED045G	2	29	6.90	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Electrical Conductivity (1:5)	EA010	2	29	6.90	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	1	12	8.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations on Alkaline Solis	ED006	1	13	7.69	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	1	4	25.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Anions - Soluble	ED040S	2	29	6.90	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx)- Soluble by Discrete Analyser	EK059G	2	29	6.90	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N - Soluble by Discrete Analyser	EK057G	2	29	6.90	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	2	29	6.90	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sodium Adsorption Ratio (SAR)	EA006	2	29	6.90	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfur - Total as S (LECO)	ED042T	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TKN as N By Discrete Analyser	EK061G	2	29	6.90	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus By Discrete Analyser	EK067G	2	29	6.90	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Bicarbonate Extractable P (Colwell)	EK080	2	29	6.90	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx)- Soluble by Discrete Analyser	EK059G	2	29	6.90	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N - Soluble by Discrete Analyser	EK057G	2	29	6.90	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	2	29	6.90	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TKN as N By Discrete Analyser	EK061G	2	29	6.90	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus By Discrete Analyser	EK067G	2	29	6.90	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH (1:5)	EA002	SOIL	In house: Referenced to Rayment and Lyons 4A1 and APHA 4500H ⁺ . pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM (2013) Schedule B(3)
Sodium Adsorption Ratio (SAR)	EA006	SOIL	In house: Referenced to USEPA 600/2 - 78 - 54. The concentration as meq of Ca, Mg and Na are determined on saturated soil by water leach. Results are used to calculate SAR.
Electrical Conductivity (1:5)	EA010	SOIL	In house: Referenced to Rayment and Lyons 3A1 and APHA 2510. Conductivity is determined on soil samples using a 1:5 soil/water leach. This method is compliant with NEPM (2013) Schedule B(3)
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Emerson Aggregate Test	EA058	SOIL	In house: Referenced to AS1289.3.8.1. Testing is performed only on soils with suitable aggregates; sands and gravels are usually unsuitable for this test. The test classifies the behaviour of soil aggregates, when immersed, on their coherence in water.
Particle Size Analysis by Hydrometer	EA150H	SOIL	Particle Size Analysis by Hydrometer according to AS1289.3.6.3 - 2003
Soil Particle Density	EA152	SOIL	Soil Particle Density by AS 1289.3.5.1-2006 : Methods of testing soils for engineering purposes - Soil classification tests - Determination of the soil particle density of a soil - Standard method
Exchangeable Cations on Alkaline Soils	ED006	SOIL	In house: Referenced to Soil Survey Test Method C5. Soluble salts are removed from the sample prior to analysis. Cations are exchanged from the sample by contact with alcoholic ammonium chloride at pH 8.5. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil.
Exchangeable Cations	ED007	SOIL	In house: Referenced to Rayment & Lyons (2011) Method 15A1. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM (2013) Schedule B(3) (Method 301)
Exchangeable Cations with pre-treatment	ED008	SOIL	In house: Referenced to Rayment & Higginson (2011) Method 15A2. Soluble salts are removed from the sample prior to analysis. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM (2013) Schedule B(3) (Method 301)
Acid extractable K (Skene)	ED022	SOIL	In house: Referenced to Rayment & Higginson (2011) Method 18B1 Potassium is extracted from the soil using 0.05M HCl at a 1:40 soil:solution ratio and determined by ICP.
Major Anions - Soluble	ED040S	SOIL	In house: Soluble Anions are determined off a 1:5 soil / water extract by ICPAES.
Sulfur - Total as S (LECO)	ED042T	SOIL	In house: Dried and pulverised sample is combusted in a high temperature furnace in the presence of strong oxidants / catalysts. The evolved S (as SO ₂) is measured by infra-red detector
Chloride Soluble By Discrete Analyser	ED045G	SOIL	In house: Referenced to APHA 4500-Cl- E. The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the liberated thiocyanate forms highly-coloured ferric thiocyanate which is measured at 480 nm. Analysis is performed on a 1:5 soil / water leachate.
Cations - soluble by ICP-AES	ED093S	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010 (ICPAES) Water extracts of the soil are analyzed for major cations by ICPAES. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)



Analytical Methods		Method	Matrix	Method Descriptions
Nitrite as N - Soluble by Discrete Analyser	EK057G	SOIL	In house: Referenced to APHA 4500-NO3- B. Nitrite in a water extract is determined by direct colourimetry by Discrete Analyser.	
Nitrate as N - Soluble by Discrete Analyser	EK058G	SOIL	In house: Referenced to APHA 4500-NO3- F. Nitrate in the 1:5 soil:water extract is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined separately by direct colourimetry and result for Nitrate calculated as the difference between the two results.	
Nitrite and Nitrate as N (NOx)- Soluble by Discrete Analyser	EK059G	SOIL	In house: Thermo Scientific Method D08727 and NEMI (National Environmental Method Index) Method ID: 9171. This method covers the determination of total oxidised nitrogen (NOx-N) and nitrate (NO3-N) by calculation, Combined oxidised Nitrogen (NO2+NO3) in a water extract is determined by direct colourimetry by Discrete Analyser.	
TKN as N By Discrete Analyser	EK061G	SOIL	In house: Referenced to APHA 4500-Norg-D Soil samples are digested using Kjeldahl digestion followed by determination by Discrete Analyser.	
Total Nitrogen as N (TKN + NOx) By Discrete Analyser	EK062G	SOIL	In house: Referenced to APHA 4500 Norg/NO3- Total Nitrogen is determined as the sum of TKN and Oxidised Nitrogen, each determined separately as N.	
Total Phosphorus By Discrete Analyser	EK067G	SOIL	In house: Referenced to APHA 4500 P-B&F This procedure involves sulfuric acid digestion and quantification using Discrete Analyser.	
Bicarbonate Extractable P (Colwell)	EK080	SOIL	In house: Referenced to Rayment & Higginson (2011) Method 9B1 Phosphorus is extracted from the soil using 0.5M NaHCO3 at a 1:100 soil:solution ratio and determined by FIA.	
Organic Matter	EP004	SOIL	In house: Referenced to AS1289.4.1.1 - 1997. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM (2013) Schedule B(3).	
Preparation Methods		Method	Matrix	Method Descriptions
SAR Prep	EA006PR	SOIL	In house: Referenced to USEPA 600/2. Soil is brought to saturation with distilled water by capillary action.	
Exchangeable Cations Preparation Method (Alkaline Soils)	ED006PR	SOIL	In house: Referenced to Rayment and Lyons 2011 method 15C1.	
Exchangeable Cations Preparation Method	ED007PR	SOIL	In house: Referenced to Rayment & Higginson (1992) method 15A1. A 1M NH4Cl extraction by end over end tumbling at a ratio of 1:20. There is no pretreatment for soluble salts. Extracts can be run by ICP for cations.	
TKN/TP Digestion	EK061/EK067	SOIL	In house: Referenced to APHA 4500 Norg- D; APHA 4500 P - H. Macro Kjeldahl digestion.	
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of reagent grade water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.	
Organic Matter	EP004-PR	SOIL	In house: Referenced to AS1289.4.1.1 - 1997. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM (2013) Schedule B(3) (Method 105)	
Dry and Pulverise (up to 100g)	GEO30	SOIL	#	

**SAMPLE RECEIPT NOTIFICATION (SRN)****Work Order : EB1807967**

Client	: GOLDER ASSOCIATES	Laboratory	: Environmental Division Brisbane
Contact	: MR STUART SMITH	Contact	: Carsten Emrich
Address	: P O BOX 1734 MILTON QLD, AUSTRALIA 4064	Address	: 2 Byth Street Stafford QLD Australia 4053
E-mail	: stusmith@golder.com.au	E-mail	: carsten.emrich@alsglobal.com
Telephone	: +61 07 3721 5400	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 3721 5401	Facsimile	: +61-7-3243 7218
Project	: 1782517	Page	: 1 of 5
Order number	: 1782517	Quote number	: EM2017GOLASS0027 (EN/002/17 National BQ)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: Dajarra		
Sampler	: STUART SMITH		

Dates

Date Samples Received	: 28-Mar-2018 13:30	Issue Date	: 29-Mar-2018
Client Requested Due Date	: 09-Apr-2018	Scheduled Reporting Date	: 09-Apr-2018

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Intact.
No. of coolers/boxes	: 4	Temperature	: 27.5 <> 28.0°C
Receipt Detail	:	No. of samples received / analysed	: 29 / 29

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- **Atterberg Limits testing will be subcontracted to Soil Surveys Engineering. The expected due date for this data is 16/04/2018.**
- Discounted Package Prices apply only when specific ALS Group Codes ('W', 'S', 'NT' suites) are referenced on COCs.
- **Where 'Cation Exchange Capacity' has been referenced, pH and electrical conductivity have been assigned as the results for these methods will be used to determine the correct method for analysis. Once the correct method has been determined, CEC will be added to this work order.**
- Please direct any turn around / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- Analysis will be conducted by ALS Environmental, Brisbane, NATA accreditation no. 825, Site No. 818 (Micro site no. 18958).
- **Breaches in recommended extraction / analysis holding times (if any) are displayed overleaf in the Proactive Holding Time Report table.**



Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- No sample container / preservation non-compliance exists.

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: SOIL

Laboratory sample ID	Client sampling date / time	Client sample ID	SOIL - EA010 (solids) Electrical Conductivity (1:5)	SOIL - EA058 Emerson Aggregate Test	SOIL - ED022 Acid Extractable K (Skene)	SOIL - EK080 Bicarbonate Extractable P (Colwell)	SOIL - NT-1S Major Cations (Ca, Mg, Na, K)	SOIL - NT-2S Major Anions (Cl, SO ₄)	SOIL - NT-6S Nitrogen, TKN, NO ₂ , NO ₃
EB1807967-001	22-Mar-2018 00:00	TP01_0.1-0.3	✓	✓	✓	✓	✓	✓	✓
EB1807967-002	22-Mar-2018 00:00	TP01_0.4-0.6	✓		✓	✓	✓	✓	✓
EB1807967-003	22-Mar-2018 00:00	TP01_0.8-1.0	✓		✓	✓	✓	✓	✓
EB1807967-004	22-Mar-2018 00:00	TP02_0.1-0.25	✓	✓	✓	✓	✓	✓	✓
EB1807967-005	22-Mar-2018 00:00	TP02_0.3-0.55	✓	✓	✓	✓	✓	✓	✓
EB1807967-006	22-Mar-2018 00:00	TP03_0.2-0.3	✓		✓	✓	✓	✓	✓
EB1807967-007	22-Mar-2018 00:00	TP03_0.4-0.6	✓		✓	✓	✓	✓	✓
EB1807967-008	22-Mar-2018 00:00	TP03_0.7-0.8	✓		✓	✓	✓	✓	✓
EB1807967-009	22-Mar-2018 00:00	TP04_0.2-0.3	✓	✓	✓	✓	✓	✓	✓
EB1807967-010	22-Mar-2018 00:00	TP04_0.5-0.6	✓		✓	✓	✓	✓	✓
EB1807967-011	22-Mar-2018 00:00	TP04_0.8-1.0	✓		✓	✓	✓	✓	✓
EB1807967-012	22-Mar-2018 00:00	TP05_0.1-0.3	✓	✓	✓	✓	✓	✓	✓
EB1807967-013	22-Mar-2018 00:00	TP05_0.4-0.6	✓		✓	✓	✓	✓	✓
EB1807967-014	22-Mar-2018 00:00	TP05_0.8-1.0	✓		✓	✓	✓	✓	✓
EB1807967-015	22-Mar-2018 00:00	TP06_0.1-0.3	✓		✓	✓	✓	✓	✓
EB1807967-016	22-Mar-2018 00:00	TP06_0.4-0.6	✓		✓	✓	✓	✓	✓
EB1807967-017	22-Mar-2018 00:00	TP06_0.8-0.95	✓		✓	✓	✓	✓	✓
EB1807967-018	21-Mar-2018 00:00	TP07_0.2-0.3	✓		✓	✓	✓	✓	✓
EB1807967-019	21-Mar-2018 00:00	TP07_0.4-0.6	✓	✓	✓	✓	✓	✓	✓
EB1807967-020	21-Mar-2018 00:00	TP07_0.7-0.9	✓		✓	✓	✓	✓	✓
EB1807967-021	22-Mar-2018 00:00	TP08_0.1-0.3	✓		✓	✓	✓	✓	✓
EB1807967-022	22-Mar-2018 00:00	TP08_0.5-0.6	✓		✓	✓	✓	✓	✓
EB1807967-023	22-Mar-2018 00:00	TP08_0.7-0.9	✓		✓	✓	✓	✓	✓
EB1807967-024	22-Mar-2018 00:00	TP09_0.1-0.3	✓	✓	✓	✓	✓	✓	✓
EB1807967-025	22-Mar-2018 00:00	TP09_0.4-0.6	✓		✓	✓	✓	✓	✓
EB1807967-026	22-Mar-2018 00:00	TP09_0.7-0.8	✓		✓	✓	✓	✓	✓
EB1807967-027	22-Mar-2018 00:00	TP10_0.1-0.3	✓		✓	✓	✓	✓	✓
EB1807967-028	22-Mar-2018 00:00	TP10_0.5-0.6	✓	✓	✓	✓	✓	✓	✓
EB1807967-029	22-Mar-2018 00:00	TP10_0.8-1.0	✓		✓	✓	✓	✓	✓



Matrix: SOIL

Laboratory sample ID	Client sampling date / time	Client sample ID	SOIL - EA002 pH (1:5)	SOIL - EA006 (solids) Sodium Adsorption Ratio	SOIL - EA055-103 Moisture Content	SOIL - EA150H/EA152 Particle Sizing with Hydrometer + Soil Particle	SOIL - ED042T Sulfur - Total as S (high temperature furnace)	SOIL - EP004 (Carbon) Organic Matter & Total Organic Carbon (Calc.)	SOIL - MIS-SOL (Subcontracted) Miscellaneous Subcontracted Analysis (Solid)
EB1807967-001	22-Mar-2018 00:00	TP01_0.1-0.3	✓	✓	✓	✓	✓	✓	✓
EB1807967-002	22-Mar-2018 00:00	TP01_0.4-0.6	✓	✓	✓		✓	✓	
EB1807967-003	22-Mar-2018 00:00	TP01_0.8-1.0	✓	✓	✓		✓	✓	
EB1807967-004	22-Mar-2018 00:00	TP02_0.1-0.25	✓	✓	✓	✓	✓	✓	✓
EB1807967-005	22-Mar-2018 00:00	TP02_0.3-0.55	✓	✓	✓	✓	✓	✓	✓
EB1807967-006	22-Mar-2018 00:00	TP03_0.2-0.3	✓	✓	✓		✓	✓	
EB1807967-007	22-Mar-2018 00:00	TP03_0.4-0.6	✓	✓	✓		✓	✓	
EB1807967-008	22-Mar-2018 00:00	TP03_0.7-0.8	✓	✓	✓		✓	✓	
EB1807967-009	22-Mar-2018 00:00	TP04_0.2-0.3	✓	✓	✓	✓	✓	✓	✓
EB1807967-010	22-Mar-2018 00:00	TP04_0.5-0.6	✓	✓	✓		✓	✓	
EB1807967-011	22-Mar-2018 00:00	TP04_0.8-1.0	✓	✓	✓		✓	✓	
EB1807967-012	22-Mar-2018 00:00	TP05_0.1-0.3	✓	✓	✓	✓	✓	✓	✓
EB1807967-013	22-Mar-2018 00:00	TP05_0.4-0.6	✓	✓	✓		✓	✓	
EB1807967-014	22-Mar-2018 00:00	TP05_0.8-1.0	✓	✓	✓		✓	✓	
EB1807967-015	22-Mar-2018 00:00	TP06_0.1-0.3	✓	✓	✓		✓	✓	
EB1807967-016	22-Mar-2018 00:00	TP06_0.4-0.6	✓	✓	✓		✓	✓	
EB1807967-017	22-Mar-2018 00:00	TP06_0.8-0.95	✓	✓	✓		✓	✓	
EB1807967-018	21-Mar-2018 00:00	TP07_0.2-0.3	✓	✓	✓		✓	✓	
EB1807967-019	21-Mar-2018 00:00	TP07_0.4-0.6	✓	✓	✓	✓	✓	✓	✓
EB1807967-020	21-Mar-2018 00:00	TP07_0.7-0.9	✓	✓	✓		✓	✓	
EB1807967-021	22-Mar-2018 00:00	TP08_0.1-0.3	✓	✓	✓		✓	✓	
EB1807967-022	22-Mar-2018 00:00	TP08_0.5-0.6	✓	✓	✓		✓	✓	
EB1807967-023	22-Mar-2018 00:00	TP08_0.7-0.9	✓	✓	✓		✓	✓	
EB1807967-024	22-Mar-2018 00:00	TP09_0.1-0.3	✓	✓	✓	✓	✓	✓	✓
EB1807967-025	22-Mar-2018 00:00	TP09_0.4-0.6	✓	✓	✓		✓	✓	
EB1807967-026	22-Mar-2018 00:00	TP09_0.7-0.8	✓	✓	✓		✓	✓	
EB1807967-027	22-Mar-2018 00:00	TP10_0.1-0.3	✓	✓	✓		✓	✓	
EB1807967-028	22-Mar-2018 00:00	TP10_0.5-0.6	✓	✓	✓	✓	✓	✓	✓
EB1807967-029	22-Mar-2018 00:00	TP10_0.8-1.0	✓	✓	✓		✓	✓	



Matrix: **SOIL**

Laboratory sample ID	Client sampling date / time	Client sample ID	SOIL - EK067G (Solids) Total Phosphorus as P by Discrete Analyser
EB1807967-001	22-Mar-2018 00:00	TP01_0.1-0.3	✓
EB1807967-002	22-Mar-2018 00:00	TP01_0.4-0.6	✓
EB1807967-003	22-Mar-2018 00:00	TP01_0.8-1.0	✓
EB1807967-004	22-Mar-2018 00:00	TP02_0.1-0.25	✓
EB1807967-005	22-Mar-2018 00:00	TP02_0.3-0.55	✓
EB1807967-006	22-Mar-2018 00:00	TP03_0.2-0.3	✓
EB1807967-007	22-Mar-2018 00:00	TP03_0.4-0.6	✓
EB1807967-008	22-Mar-2018 00:00	TP03_0.7-0.8	✓
EB1807967-009	22-Mar-2018 00:00	TP04_0.2-0.3	✓
EB1807967-010	22-Mar-2018 00:00	TP04_0.5-0.6	✓
EB1807967-011	22-Mar-2018 00:00	TP04_0.8-1.0	✓
EB1807967-012	22-Mar-2018 00:00	TP05_0.1-0.3	✓
EB1807967-013	22-Mar-2018 00:00	TP05_0.4-0.6	✓
EB1807967-014	22-Mar-2018 00:00	TP05_0.8-1.0	✓
EB1807967-015	22-Mar-2018 00:00	TP06_0.1-0.3	✓
EB1807967-016	22-Mar-2018 00:00	TP06_0.4-0.6	✓
EB1807967-017	22-Mar-2018 00:00	TP06_0.8-0.95	✓
EB1807967-018	21-Mar-2018 00:00	TP07_0.2-0.3	✓
EB1807967-019	21-Mar-2018 00:00	TP07_0.4-0.6	✓
EB1807967-020	21-Mar-2018 00:00	TP07_0.7-0.9	✓
EB1807967-021	22-Mar-2018 00:00	TP08_0.1-0.3	✓
EB1807967-022	22-Mar-2018 00:00	TP08_0.5-0.6	✓
EB1807967-023	22-Mar-2018 00:00	TP08_0.7-0.9	✓
EB1807967-024	22-Mar-2018 00:00	TP09_0.1-0.3	✓
EB1807967-025	22-Mar-2018 00:00	TP09_0.4-0.6	✓
EB1807967-026	22-Mar-2018 00:00	TP09_0.7-0.8	✓
EB1807967-027	22-Mar-2018 00:00	TP10_0.1-0.3	✓
EB1807967-028	22-Mar-2018 00:00	TP10_0.5-0.6	✓
EB1807967-029	22-Mar-2018 00:00	TP10_0.8-1.0	✓

Proactive Holding Time Report

The following table summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory.

Matrix: **SOIL**

Evaluation: ✗ = Holding time breach ; ✓ = Within holding time.

Method		Due for extraction	Due for analysis	Samples Received		Instructions Received	
				Date	Evaluation	Date	Evaluation
Client Sample ID(s)	Container						
EA002: pH (1:5)							
TP07_0.2-0.3	Snap Lock Bag	28-Mar-2018	28-Mar-2018	28-Mar-2018	✓	29-Mar-2018	✗
TP07_0.4-0.6	Snap Lock Bag	28-Mar-2018	28-Mar-2018	28-Mar-2018	✓	29-Mar-2018	✗
TP07_0.7-0.9	Snap Lock Bag	28-Mar-2018	28-Mar-2018	28-Mar-2018	✓	29-Mar-2018	✗
EA010: Electrical Conductivity (1:5)							
TP07_0.2-0.3	Snap Lock Bag	28-Mar-2018	25-Apr-2018	28-Mar-2018	✓	29-Mar-2018	✗



Requested Deliverables

- A4 - AU Tax Invoice (INV)

Email auaccountspayable@golder.com.au

- *AU Certificate of Analysis - NATA (COA)

Email stusmith@golder.com.au

- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)

Email stusmith@golder.com.au

- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)

Email stusmith@golder.com.au

- A4 - AU Sample Receipt Notification - Environmental HT (SRN)

Email stusmith@golder.com.au

- Attachment - Report (SUBCO)

Email stusmith@golder.com.au

- Chain of Custody (CoC) (COC)

Email stusmith@golder.com.au

- EDI Format - EQUIS V5 Generic (EQUIS V5)

Email stusmith@golder.com.au

- EDI Format - ESDAT (ESDAT)

Email stusmith@golder.com.au

- EDI Format - GOLDER EXCEL (GOLDER EXCEL)

Email stusmith@golder.com.au

SAMPLE CHAIN OF CUSTODY DOCUMENTATION

Sheet of

Project ID:	1782517	Quote/Order No:	BN/058/18
Site Location:	Dajarra	Lab Name:	ALS
Sampled By:	Stuart Smith		
Turnaround (Days):	7 to 10		

GOLDER ASSOCIATES PTY LTD 147 Coronation Drive, Milton, 4064 Phone: (07) 3721 5400 Fax: (07) 3721 5401	
Project Manager: Lochlan Gibson Contact Phone: 3721 5400 Email:	

Report Format:	☐ PDF ☒ Excel	DISK ☐ EMAIL ☒ BULLETIN BOARD ☐
Other:		
Comments/Special Instructions:	esdat files Send results to - stusmith@golder.com.au NA Samples from a declared Fire Ant Area: Samples taken from a known Weed and for Pest Area:	

SAMPLE ID	Location & Depth	SAMPLE MATRIX	SAMPLE DATE	SAMPLE TIME	CONTAINER/PRESERVATIVE	No CONTAINERS	POSSIBLE HIGH CONCENTRATION
TP01 0.1-0.3	Soil	Soil	22-03-18			2	
TP01 0.4-0.6		Soil	22-03-18			1	
TP01 0.8-1.0		Soil	22-03-18			1	
TP02 0.1-0.25		Soil	22-03-18			2	
TP02 0.3-0.55		Soil	22-03-18			2	
TP03 0.2-0.3		Soil	22-03-18			1	
TP03 0.4-0.6		Soil	22-03-18			1	
TP03 0.7-0.8		Soil	22-03-18			1	
TP04 0.2-0.3		Soil	22-03-18			2	
TP04 0.5-0.6		Soil	22-03-18			1	
TP04 0.8-1.0	Soil	Soil	22-03-18			1	
TP05 0.1-0.3		Soil	22-03-18			2	
TP05 0.4-0.6		Soil	22-03-18			1	
TP05 0.8-1.0		Soil	22-03-18			1	
TP06 0.1-0.3		Soil	22-03-18			1	
TP06 0.4-0.6		Soil	22-03-18			1	
TP06 0.8-0.95		Soil	22-03-18			1	
TP07 0.2-0.3		Soil	21-03-18			1	
TP07 0.4-0.6		Soil	21-03-18			2	
TP07 0.7-0.9		Soil	21-03-18			1	

SAMPLE TYPE = Composite(C)/Discrete(DC)/Disturbed(DS)/Core(CR)

HIGH CONCENTRATION: Tick box and circle expected parameters in analysis list

SIGNATURE	COMPANY	DATE	TIME
RELEASED BY Stuart Smith	GOLDER	28-03-18	3:40pm
RECEIVED BY			
RECEIVED BY			
RECEIVED BY			
RECEIVED BY			
RECEIVED BY			

SIGNATURE	COMPANY	DATE	TIME
RELEASED BY			
RECEIVED BY			

Environmental Division
Brisbane
Work Order Reference
EB1807967



Telephone : + 61 7 3243 7222

THIS FORM IS TO BE SIGNED BY GOLDER STAFF; COURIER/S; LABORATORY ON RECEIPT OF SAMPLES.

Project ID: 1782517		Quote/Order No. BN/058/18		GOLDER ASSOCIATES PTY LTD Phone: (07) 3721 5400 Fax: (07) 3721 5401	
Site Location: Millmerran		Lab Name: ALS		147 Cavanagh Drive, Milton, 4064	
Sampled By: Stuart Smith		7 to 10		Invoice to be sent to: auaccounts@golder.com.au	
Turnaround (Days)		HARD		Project Manager: Lochlan Gibson	
Report Format: PDF		FAX		Contact Phone: 3721 5400	
Email Format: PDF		Email		Email:	
Comments/Special Instructions:		BULLETIN BOARD		ANALYSIS REQUIRED	
Samples from a declared Fire Ant Area: Samples taken from a known Weed and or Pest Area:		NA		EA006 - SAR calculation EA006 - 7 or 8 - CBC with EA006 pH (1:5) EA010 - Electrical Conductivity (EC) EA010 - Soluble Cations (Ca, Mg, K, Na) EA010 - Soluble Sulfate EA010 - Nitrate, Nitrite, TKN, Nox EA010 - Colwell Extractable P EA010 - Acid Extractable K EA010 - Organic Matter EA010 - Acid Extractable K (Stene) EA010 - Emerson Classification EA010 - SOL: Atterberg Limits EA010 - PSD with hydrometer HOLD	
21	TP08 0.1-0.3	Soil	22-03-18	1	
22	TP08 0.5-0.6	Soil	22-03-18	1	
23	TP08 0.7-0.9	Soil	22-03-18	1	
24	TP09 0.1-0.3	Soil	22-03-18	2	
25	TP09 0.4-0.6	Soil	22-03-18	1	
26	TP09 0.7-0.8	Soil	22-03-18	1	
27	TP10 0.1-0.3	Soil	22-03-18	1	
28	TP10 0.5-0.6	Soil	22-03-18	2	
29	TP10 0.8-1.0	Soil	22-03-18	1	
SAMPLE MATRIX = Soil/Sediment/Flu/Other Container Type and Preservative Codes: P = Natural Plastic; N = Nitric Acid Preserved; C = Sodium Hydroxide Preserved; J = Solvent Washed Acid Rinsed Jar; S = Solvent Washed Acid Rinsed Glass Bottle; VC = Hydrochloric Preserved Vial; VS = Sulphuric Acid P					
SAMPLE TYPE = Composite(C)/Discrete(DC)/Disturbed(DS)/Core(CR) HIGH CONCENTRATION: Tick box and circle expected parameters in analysis list					
SIGNATURE RELEASED BY RECEIVED BY RELEASED BY RECEIVED BY RELEASED BY RECEIVED BY					TIME DATE COMPANY SIGNATURE RELEASED BY RECEIVED BY To Be Filled Out By: Analytical Laboratory Security Seal Suitable Containers Cool Box
SIGNATURE RELEASED BY RECEIVED BY RELEASED BY RECEIVED BY RELEASED BY RECEIVED BY					TIME DATE COMPANY SIGNATURE RELEASED BY RECEIVED BY To Be Filled Out By: Analytical Laboratory Security Seal Suitable Containers Cool Box

Certificate of Analysis

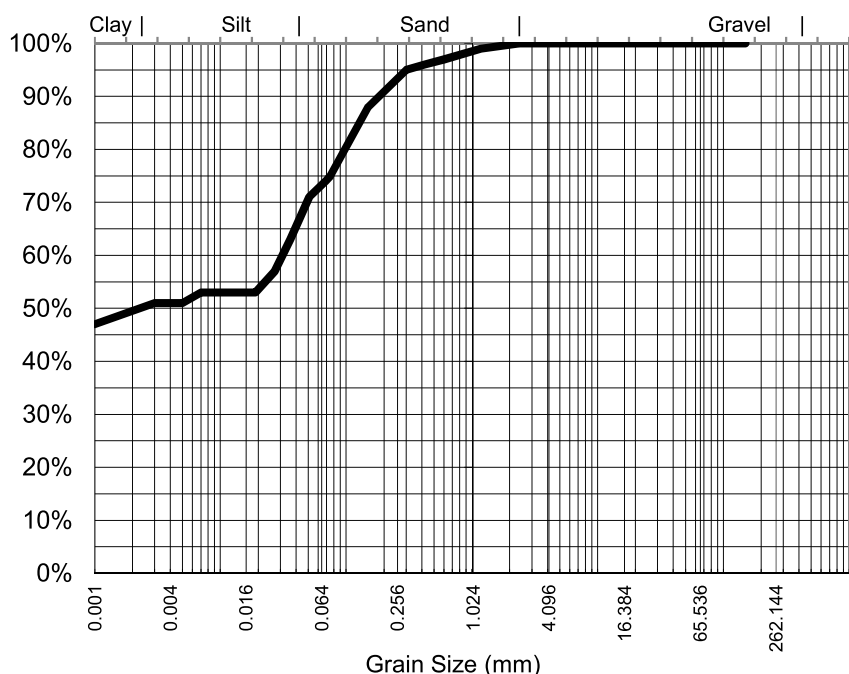
ALS Laboratory Group Pty Ltd
2 Byth Street, Stafford, QLD 4053
pH 07 3552 8678
fax 07 3352 3662
samples.brisbane@alsenviro.com

ALS Environmental
Brisbane, QLD



CLIENT: MR STUART SMITH **DATE REPORTED:** 9-Apr-2018
COMPANY: GOLDER ASSOCIATES **DATE RECEIVED:** 28-Mar-2018
ADDRESS: P O BOX 1734 **REPORT NO:** EB1807967-001 / PSD
MILTON QLD,
AUSTRALIA 4064
PROJECT: 1782517 **SAMPLE ID:** TP01_0.1-0.3

Particle Size Distribution



Particle Size (mm)	Percent Passing
2.36	100%
1.18	99%
0.600	97%
0.425	96%
0.300	95%
0.150	88%
0.075	75%
Particle Size (microns)	
69	74%
51	71%
36	63%
19	53%
10	53%
5	51%
1	47%

Median Particle Size (mm)*	0.003
----------------------------	-------

Samples analysed as received.

* Soil Particle Density results fell outside the scope of AS 1289.3.6.3. Typical sediment SPD values used for calculations and consequently, NATA endorsement does not apply to hydrometer results

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Loss on Pretreatment NA

Sample Description:

Test Method: AS1289.3.6.3 2003

Soil Particle Density (<2.36mm) 2.42 (2.45)* g/cm3

NATA Accreditation: 825 **Site:** Newcastle

This document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO/IEC 17025. This document shall not be reproduced, except in full.



Analysed: 6-Apr-18

Limit of Reporting: 1%

Dispersion Method Shaker

Hydrometer Type ASTM E100

Satish Trivedi

Soil Chemist

Authorised Signatory

Certificate of Analysis

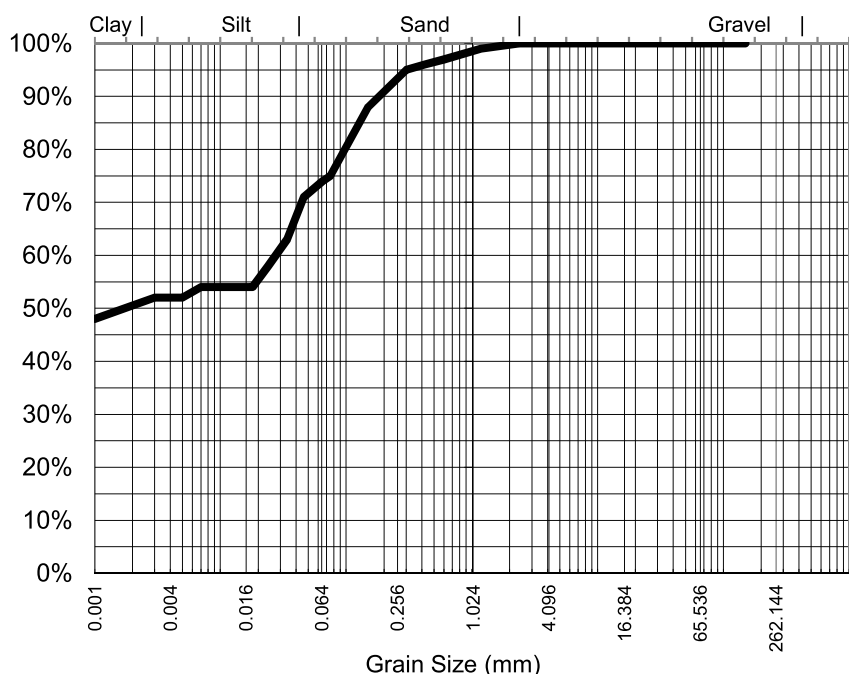
ALS Laboratory Group Pty Ltd
2 Byth Street, Stafford, QLD 4053
pH 07 3552 8678
fax 07 3352 3662
samples.brisbane@alsenviro.com

ALS Environmental
Brisbane, QLD



CLIENT: MR STUART SMITH **DATE REPORTED:** 9-Apr-2018
COMPANY: GOLDER ASSOCIATES **DATE RECEIVED:** 28-Mar-2018
ADDRESS: P O BOX 1734 **REPORT NO:** EB1807967-001DUP / PSD
MILTON QLD,
AUSTRALIA 4064
PROJECT: 1782517 **SAMPLE ID:** TP01_0.1-0.3

Particle Size Distribution



Particle Size (mm)	Percent Passing
2.36	100%
1.18	99%
0.600	97%
0.425	96%
0.300	95%
0.150	88%
0.075	75%
Particle Size (microns)	
65	74%
46	71%
34	63%
18	54%
9	54%
5	52%
1	48%

Samples analysed as received.

* Soil Particle Density required for Hydrometer analysis according to AS 1289.3.5.1—2006 was not requested by the client. Typical sediment SPD values used for calculations and consequently, NATA endorsement does not apply to hydrometer results

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Median Particle Size (mm)*	0.002
----------------------------	-------

Sample Comments:

Loss on Pretreatment NA

Sample Description:

Test Method: AS1289.3.6.3 2003

Soil Particle Density (<2.36mm) #N/A g/cm³

NATA Accreditation: 825 **Site:** Newcastle

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Analysed: 6-Apr-18

Limit of Reporting: 1%

Dispersion Method Shaker

Hydrometer Type ASTM E100

Satish Trivedi

Soil Chemist

Authorised Signatory

Certificate of Analysis

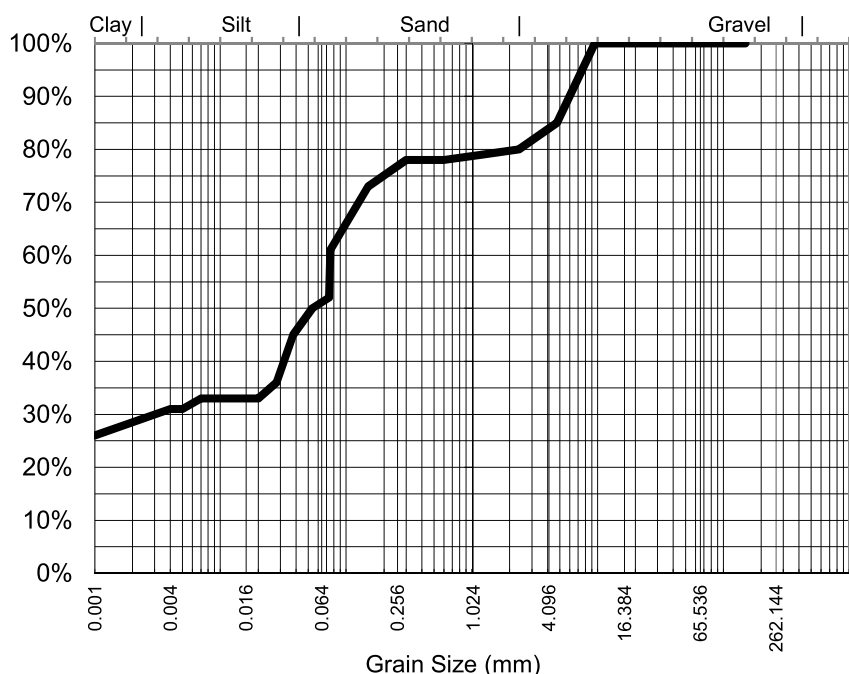
ALS Laboratory Group Pty Ltd
2 Byth Street, Stafford, QLD 4053
pH 07 3552 8678
fax 07 3352 3662
samples.brisbane@alsenviro.com

ALS Environmental
Brisbane, QLD



CLIENT: MR STUART SMITH **DATE REPORTED:** 9-Apr-2018
COMPANY: GOLDER ASSOCIATES **DATE RECEIVED:** 28-Mar-2018
ADDRESS: P O BOX 1734 **REPORT NO:** EB1807967-004 / PSD
MILTON QLD,
AUSTRALIA 4064
PROJECT: 1782517 **SAMPLE ID:** TP02_0.1-0.25

Particle Size Distribution



Particle Size (mm)	Percent Passing
9.50	100%
4.75	85%
2.36	80%
1.18	79%
0.600	78%
0.425	78%
0.300	78%
0.150	73%
0.075	61%
Particle Size (microns)	
73	52%
54	50%
38	45%
20	33%
10	33%
5	31%
1	26%

Samples analysed as received.

* Soil Particle Density results fell outside the scope of AS 1289.3.6.3. Typical sediment SPD values used for calculations and consequently, NATA endorsement does not apply to hydrometer results

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Loss on Pretreatment NA

Sample Description:

Test Method: AS1289.3.6.3 2003

Soil Particle Density (<2.36mm) 2.36 (2.45)* g/cm3

NATA Accreditation: 825 **Site:** Newcastle

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Analysed: 6-Apr-18

Limit of Reporting: 1%

Dispersion Method Shaker

Hydrometer Type ASTM E100

Satish Trivedi

Soil Chemist

Authorised Signatory

Certificate of Analysis

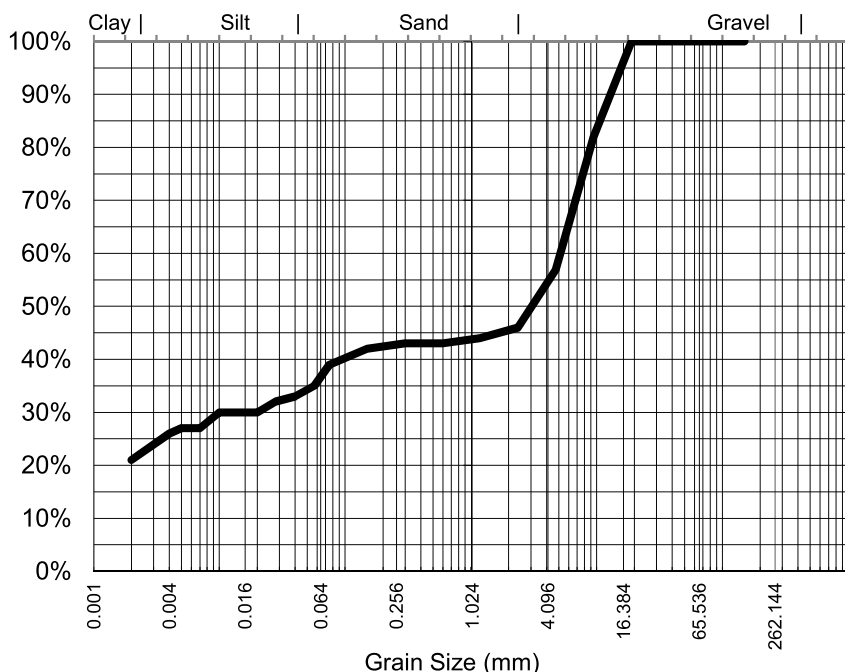
ALS Laboratory Group Pty Ltd
2 Byth Street, Stafford, QLD 4053
pH 07 3552 8678
fax 07 3352 3662
samples.brisbane@alsenviro.com

ALS Environmental
Brisbane, QLD



CLIENT: MR STUART SMITH **DATE REPORTED:** 9-Apr-2018
COMPANY: GOLDER ASSOCIATES **DATE RECEIVED:** 28-Mar-2018
ADDRESS: P O BOX 1734 **REPORT NO:** EB1807967-005 / PSD
MILTON QLD,
AUSTRALIA 4064
PROJECT: 1782517 **SAMPLE ID:** TP02_0.3-0.55

Particle Size Distribution



Particle Size (mm)	Percent Passing
19.0	100%
9.50	82%
4.75	57%
2.36	46%
1.18	44%
0.600	43%
0.425	43%
0.300	43%
0.150	42%
0.075	39%
Particle Size (microns)	
75	39%
57	35%
40	33%
20	30%
10	30%
5	27%
2	21%

Samples analysed as received.

* Soil Particle Density results fell outside the scope of AS 1289.3.6.3. Typical sediment SPD values used for calculations and consequently, NATA endorsement does not apply to hydrometer results

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Loss on Pretreatment NA

Sample Description:

Test Method: AS1289.3.6.3 2003

Soil Particle Density (<2.36mm) 2.35 (2.45)* g/cm3

NATA Accreditation: 825 Site: Newcastle
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Analysed: 6-Apr-18

Limit of Reporting: 1%

Dispersion Method Shaker

Hydrometer Type ASTM E100

Satish Trivedi
Soil Chemist
Authorised Signatory

Certificate of Analysis

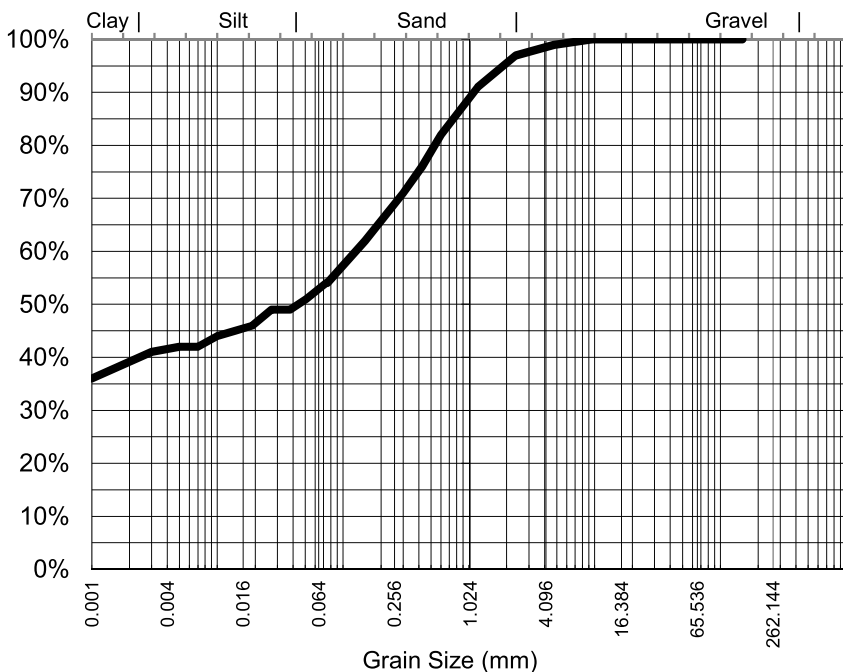
ALS Laboratory Group Pty Ltd
2 Byth Street, Stafford, QLD 4053
pH 07 3552 8678
fax 07 3352 3662
samples.brisbane@alsenviro.com

ALS Environmental
Brisbane, QLD



CLIENT: MR STUART SMITH **DATE REPORTED:** 9-Apr-2018
COMPANY: GOLDER ASSOCIATES **DATE RECEIVED:** 28-Mar-2018
ADDRESS: P O BOX 1734 **REPORT NO:** EB1807967-009 / PSD
MILTON QLD,
AUSTRALIA 4064
PROJECT: 1782517 **SAMPLE ID:** TP04_0.2-0.3

Particle Size Distribution



Particle Size (mm)	Percent Passing
9.50	100%
4.75	99%
2.36	97%
1.18	91%
0.600	82%
0.425	76%
0.300	71%
0.150	62%
0.075	54%
Particle Size (microns)	
73	54%
51	51%
38	49%
19	46%
10	44%
5	42%
1	36%

Samples analysed as received.

Median Particle Size (mm)*	0.045
----------------------------	-------

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Loss on Pretreatment NA

Sample Description:

Test Method: AS1289.3.6.3 2003

Soil Particle Density (<2.36mm) 2.45 g/cm³

NATA Accreditation: 825 Site: Newcastle
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Analysed: 6-Apr-18

Limit of Reporting: 1%

Dispersion Method Shaker

Hydrometer Type ASTM E100

Satish Trivedi
Soil Chemist
Authorised Signatory

Certificate of Analysis

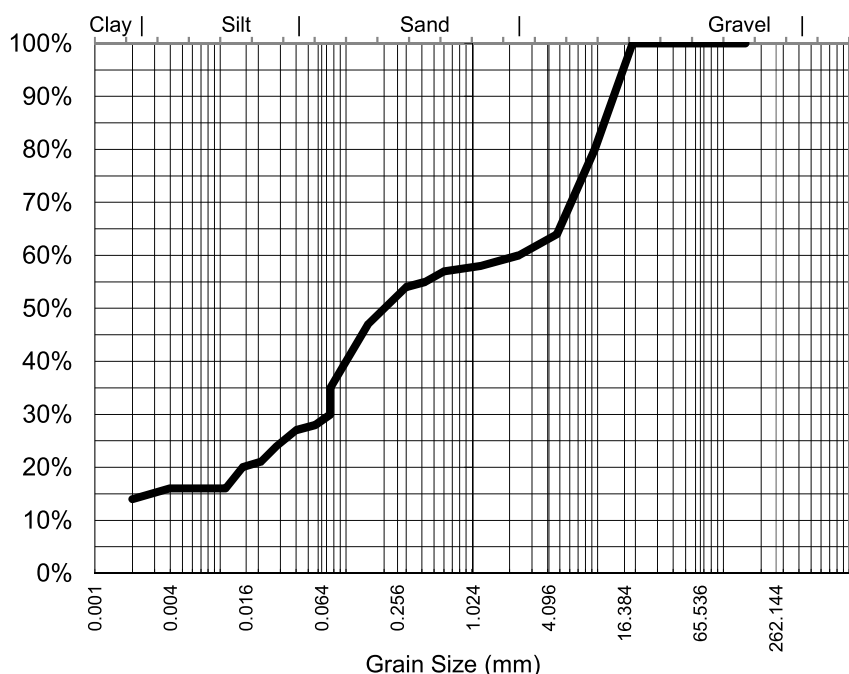
ALS Laboratory Group Pty Ltd
2 Byth Street, Stafford, QLD 4053
pH 07 3552 8678
fax 07 3352 3662
samples.brisbane@alsenviro.com

ALS Environmental
Brisbane, QLD



CLIENT: MR STUART SMITH **DATE REPORTED:** 9-Apr-2018
COMPANY: GOLDER ASSOCIATES **DATE RECEIVED:** 28-Mar-2018
ADDRESS: P O BOX 1734 **REPORT NO:** EB1807967-012 / PSD
MILTON QLD,
AUSTRALIA 4064
PROJECT: 1782517 **SAMPLE ID:** TP05_0.1-0.3

Particle Size Distribution



Particle Size (mm)	Percent Passing
19.0	100%
9.50	80%
4.75	64%
2.36	60%
1.18	58%
0.600	57%
0.425	55%
0.300	54%
0.150	47%
0.075	35%
Particle Size (microns)	
75	30%
57	28%
40	27%
21	21%
11	16%
5	16%
2	14%

Median Particle Size (mm)*	0.214
----------------------------	-------

Samples analysed as received.

* Soil Particle Density results fell outside the scope of AS 1289.3.6.3. Typical sediment SPD values used for calculations and consequently, NATA endorsement does not apply to hydrometer results

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Loss on Pretreatment NA

Sample Description:

Test Method: AS1289.3.6.3 2003

Soil Particle Density (<2.36mm) 2.38 (2.45)* g/cm3

NATA Accreditation: 825 Site: Newcastle
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Analysed: 6-Apr-18

Limit of Reporting: 1%

Dispersion Method Shaker

Hydrometer Type ASTM E100

Satish Trivedi
Soil Chemist
Authorised Signatory

Certificate of Analysis

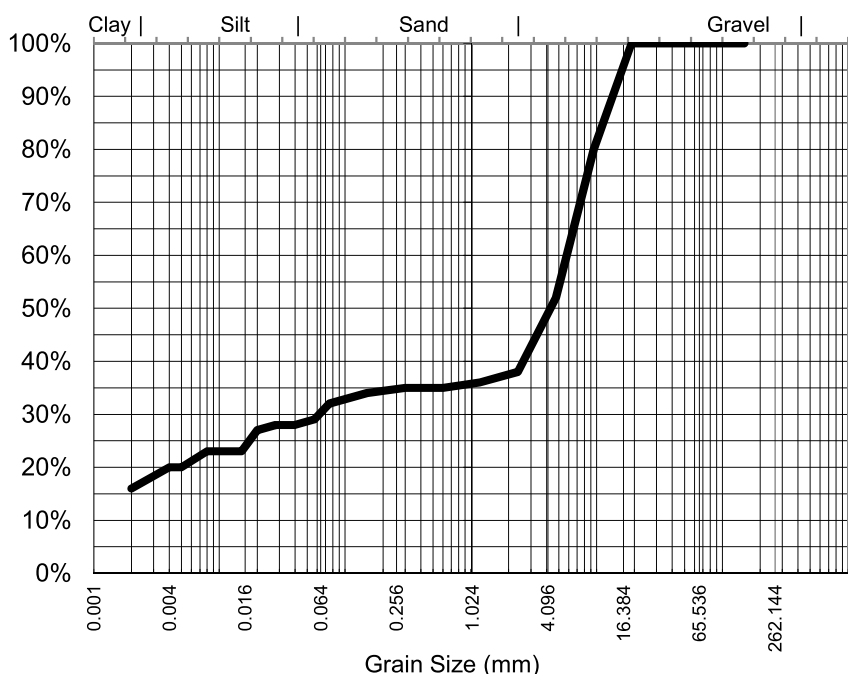
ALS Laboratory Group Pty Ltd
2 Byth Street, Stafford, QLD 4053
pH 07 3552 8678
fax 07 3352 3662
samples.brisbane@alsenviro.com

ALS Environmental
Brisbane, QLD



CLIENT: MR STUART SMITH **DATE REPORTED:** 9-Apr-2018
COMPANY: GOLDER ASSOCIATES **DATE RECEIVED:** 28-Mar-2018
ADDRESS: P O BOX 1734 **REPORT NO:** EB1807967-019 / PSD
MILTON QLD,
AUSTRALIA 4064
PROJECT: 1782517 **SAMPLE ID:** TP07_0.4-0.6

Particle Size Distribution



Particle Size (mm)	Percent Passing
19.0	100%
9.50	80%
4.75	52%
2.36	38%
1.18	36%
0.600	35%
0.425	35%
0.300	35%
0.150	34%
0.075	32%
Particle Size (microns)	
75	32%
57	29%
40	28%
20	27%
11	23%
5	20%
2	16%

Median Particle Size (mm)*	4.409
----------------------------	-------

Samples analysed as received.

* Soil Particle Density results fell outside the scope of AS 1289.3.6.3. Typical sediment SPD values used for calculations and consequently, NATA endorsement does not apply to hydrometer results

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Loss on Pretreatment NA

Sample Description:

Test Method: AS1289.3.6.3 2003

Soil Particle Density (<2.36mm) 2.42 (2.45)* g/cm3

NATA Accreditation: 825 Site: Newcastle
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Analysed: 6-Apr-18

Limit of Reporting: 1%

Dispersion Method Shaker

Hydrometer Type ASTM E100

Satish Trivedi
Soil Chemist
Authorised Signatory

Certificate of Analysis

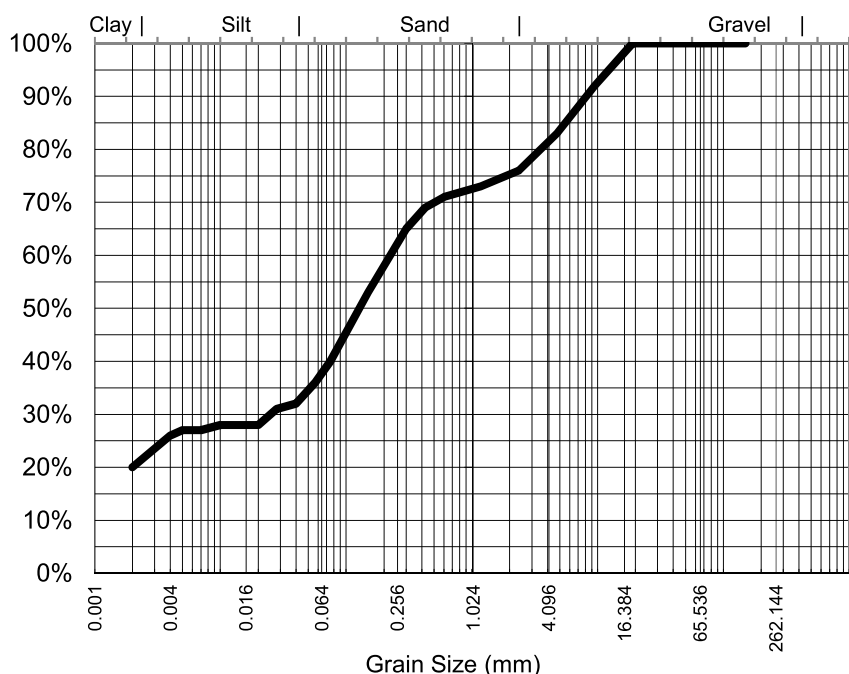
ALS Laboratory Group Pty Ltd
2 Byth Street, Stafford, QLD 4053
pH 07 3552 8678
fax 07 3352 3662
samples.brisbane@alsenviro.com

ALS Environmental
Brisbane, QLD



CLIENT: MR STUART SMITH **DATE REPORTED:** 9-Apr-2018
COMPANY: GOLDER ASSOCIATES **DATE RECEIVED:** 28-Mar-2018
ADDRESS: P O BOX 1734 **REPORT NO:** EB1807967-024 / PSD
MILTON QLD,
AUSTRALIA 4064
PROJECT: 1782517 **SAMPLE ID:** TP09_0.1-0.3

Particle Size Distribution



Particle Size (mm)	Percent Passing
19.0	100%
9.50	92%
4.75	83%
2.36	76%
1.18	73%
0.600	71%
0.425	69%
0.300	65%
0.150	53%
0.075	40%
Particle Size (microns)	
75	40%
57	36%
40	32%
20	28%
10	28%
5	27%
2	20%

Median Particle Size (mm)*	0.133
----------------------------	-------

Samples analysed as received.

* Soil Particle Density results fell outside the scope of AS 1289.3.6.3. Typical sediment SPD values used for calculations and consequently, NATA endorsement does not apply to hydrometer results

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Loss on Pretreatment NA

Sample Description:

Test Method: AS1289.3.6.3 2003

Soil Particle Density (<2.36mm) 2.36 (2.45)* g/cm3

NATA Accreditation: 825 Site: Newcastle
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Analysed: 6-Apr-18

Limit of Reporting: 1%

Dispersion Method Shaker

Hydrometer Type ASTM E100

Satish Trivedi
Soil Chemist
Authorised Signatory

Certificate of Analysis

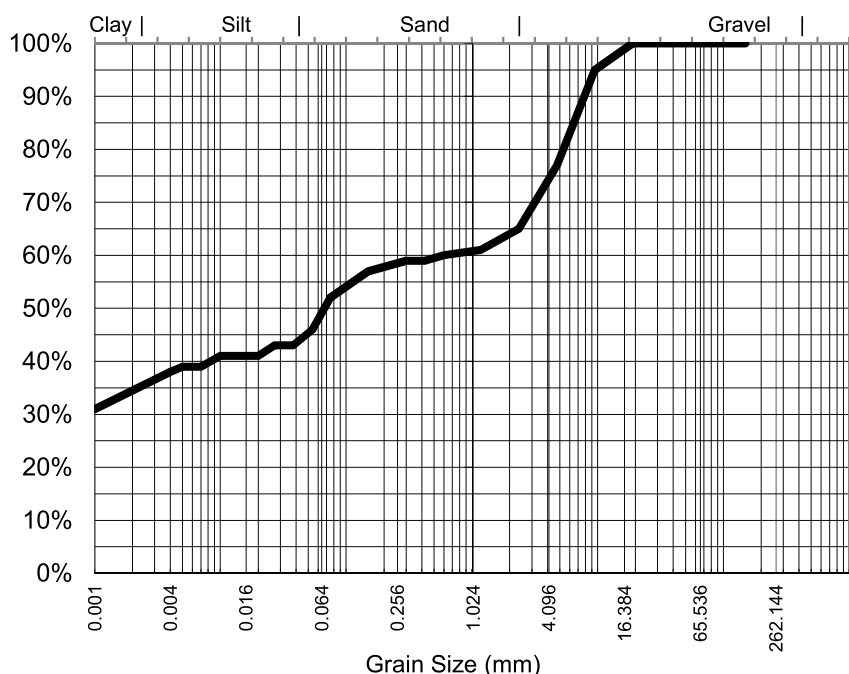
ALS Laboratory Group Pty Ltd
2 Byth Street, Stafford, QLD 4053
pH 07 3552 8678
fax 07 3352 3662
samples.brisbane@alsenviro.com

ALS Environmental
Brisbane, QLD



CLIENT: MR STUART SMITH **DATE REPORTED:** 9-Apr-2018
COMPANY: GOLDER ASSOCIATES **DATE RECEIVED:** 28-Mar-2018
ADDRESS: P O BOX 1734 **REPORT NO:** EB1807967-028 / PSD
MILTON QLD,
AUSTRALIA 4064
PROJECT: 1782517 **SAMPLE ID:** TP10_0.5-0.6

Particle Size Distribution



Particle Size (mm)	Percent Passing
19.0	100%
9.50	95%
4.75	77%
2.36	65%
1.18	61%
0.600	60%
0.425	59%
0.300	59%
0.150	57%
0.075	52%
Particle Size (microns)	
75	52%
54	46%
38	43%
20	41%
10	41%
5	39%
1	31%

Median Particle Size (mm)*	0.068
----------------------------	-------

Samples analysed as received.

* Soil Particle Density results fell outside the scope of AS 1289.3.6.3. Typical sediment SPD values used for calculations and consequently, NATA endorsement does not apply to hydrometer results

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Loss on Pretreatment NA

Sample Description:

Test Method: AS1289.3.6.3 2003

Soil Particle Density (<2.36mm) 2.35 (2.45)* g/cm3

NATA Accreditation: 825 **Site:** Newcastle

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Analysed: 6-Apr-18

Limit of Reporting: 1%

Dispersion Method Shaker

Hydrometer Type ASTM E100

Satish Trivedi

Soil Chemist

Authorised Signatory

Report No: MAT:WHL18-0299-S1

Issue No: 1

Material Test Report

Client: ALS
C/O 2/19 Finchley Street
Milton QLD 4064

Project: Sample Testing (PO 503368)

Project Location: Stafford (ALS Batch No. EB1807967)

Project Number: 1-20174



Accredited for compliance with ISO/IEC 17025 - Testing



NATA Accredited Approved Signatory: C. Ferguson-Hannah
Laboratory Number: (Senior Technician)

15301 Date of Issue: 13/04/2018

THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

Sample Details

Sample ID: WHL18-0299-S1

Field Sample ID:

Date Sampled: 28/03/2018

Source: Test Pit

Material: Unknown

Specification:

Sampling Method: As Supplied

Soil Description:

Sampled By: Client

Location Description: TP 01
0.1-0.3m

Test Results

Description	Method	Result	Limits
Atterberg Limits Casagrande [AS 1289.3.1.2, AS 1289.3.2.1, AS 1289.3.3.1, AS 1289.3.4.1]			
Sample History	AS 1289.1.1	Air-dried	
Preparation	AS 1289.1.1	Dry Sieved	
Linear Shrinkage (%)	AS 1289.3.4.1	20.5	
Mould Length (mm)		125.1	
Crumbling		No	
Curling		No	
Liquid Limit (%)	AS 1289.3.1.2	70	
Method		One Point	
Plastic Limit (%)	AS 1289.3.2.1	16	
Plasticity Index (%)	AS 1289.3.3.1	54	

Comments

N/A

Report No: MAT:WHL18-0299-S2

Issue No: 1

Material Test Report

Client: ALS
C/O 2/19 Finchley Street
Milton QLD 4064

Project: Sample Testing (PO 503368)

Project Location: Stafford (ALS Batch No. EB1807967)

Project Number: 1-20174



Accredited for compliance with ISO/IEC 17025 - Testing



NATA Accredited Approved Signatory: C. Ferguson-Hannah
Laboratory Number: (Senior Technician)

15301 Date of Issue: 13/04/2018

THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

Sample Details

Sample ID: WHL18-0299-S2

Field Sample ID:

Date Sampled: 28/03/2018

Source: Test Pit

Material: Unknown

Specification:

Sampling Method: As Supplied

Soil Description:

Sampled By: Client

Location Description: TP 02
0.1-0.25m

Test Results

Description	Method	Result	Limits
Atterberg Limits Casagrande [AS 1289.3.1.2, AS 1289.3.2.1, AS 1289.3.3.1, AS 1289.3.4.1]			
Sample History	AS 1289.1.1	Air-dried	
Preparation	AS 1289.1.1	Dry Sieved	
Linear Shrinkage (%)	AS 1289.3.4.1	10.0	
Mould Length (mm)		125.4	
Crumbling		No	
Curling		No	
Liquid Limit (%)	AS 1289.3.1.2	29	
Method		One Point	
Plastic Limit (%)	AS 1289.3.2.1	15	
Plasticity Index (%)	AS 1289.3.3.1	14	

Comments

N/A

Report No: MAT:WHL18-0299-S3

Issue No: 1

Material Test Report

Client: ALS
C/O 2/19 Finchley Street
Milton QLD 4064

Project: Sample Testing (PO 503368)

Project Location: Stafford (ALS Batch No. EB1807967)

Project Number: 1-20174



Accredited for compliance with ISO/IEC 17025 - Testing



NATA Accredited Approved Signatory: C. Ferguson-Hannah
Laboratory Number: (Senior Technician)

15301 Date of Issue: 13/04/2018

THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

Sample Details

Sample ID: WHL18-0299-S3

Field Sample ID:

Date Sampled: 28/03/2018

Source: Test Pit

Material: Unknown

Specification:

Sampling Method: As Supplied

Soil Description:

Sampled By: Client

Location Description: TP 02
0.3-0.55m

Test Results

Description	Method	Result	Limits
Atterberg Limits Casagrande [AS 1289.3.1.2, AS 1289.3.2.1, AS 1289.3.3.1, AS 1289.3.4.1]			
Sample History	AS 1289.1.1	Air-dried	
Preparation	AS 1289.1.1	Dry Sieved	
Linear Shrinkage (%)	AS 1289.3.4.1	14.5	
Mould Length (mm)		125.3	
Crumbling		No	
Curling		No	
Liquid Limit (%)	AS 1289.3.1.2	41	
Method		One Point	
Plastic Limit (%)	AS 1289.3.2.1	20	
Plasticity Index (%)	AS 1289.3.3.1	21	

Comments

N/A

Report No: MAT:WHL18-0299-S4

Issue No: 1

Material Test Report

Client: ALS
C/O 2/19 Finchley Street
Milton QLD 4064

Project: Sample Testing (PO 503368)

Project Location: Stafford (ALS Batch No. EB1807967)

Project Number: 1-20174



Accredited for compliance with ISO/IEC 17025 - Testing



NATA Accredited Approved Signatory: C. Ferguson-Hannah
Laboratory Number: (Senior Technician)

15301 Date of Issue: 13/04/2018

THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

Sample Details

Sample ID: WHL18-0299-S4

Field Sample ID:

Date Sampled: 28/03/2018

Source: Test Pit

Material: Unknown

Specification:

Sampling Method: As Supplied

Soil Description:

Sampled By: Client

Location Description: TP 04
0.2-0.3m

Test Results

Description	Method	Result	Limits
Atterberg Limits Casagrande [AS 1289.3.1.2, AS 1289.3.2.1, AS 1289.3.3.1, AS 1289.3.4.1]			
Sample History	AS 1289.1.1	Air-dried	
Preparation	AS 1289.1.1	Dry Sieved	
Linear Shrinkage (%)	AS 1289.3.4.1	10.5	
Mould Length (mm)		125.2	
Crumbling		No	
Curling		No	
Liquid Limit (%)	AS 1289.3.1.2	28	
Method		One Point	
Plastic Limit (%)	AS 1289.3.2.1	13	
Plasticity Index (%)	AS 1289.3.3.1	15	
Date Tested		12/04/2018	

Comments

N/A

Report No: MAT:WHL18-0299-S5

Issue No: 1

Material Test Report

Client: ALS
C/O 2/19 Finchley Street
Milton QLD 4064

Project: Sample Testing (PO 503368)

Project Location: Stafford (ALS Batch No. EB1807967)

Project Number: 1-20174



Accredited for compliance with ISO/IEC 17025 - Testing



NATA Accredited Approved Signatory: C. Ferguson-Hannah
Laboratory Number: (Senior Technician)

15301 Date of Issue: 13/04/2018

THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

Sample Details

Sample ID: WHL18-0299-S5

Field Sample ID:

Date Sampled: 28/03/2018

Source: Test Pit

Material: Unknown

Specification:

Sampling Method: As Supplied

Soil Description:

Sampled By: Client

Location Description: TP 05
0.1-0.3m

Test Results

Description	Method	Result	Limits
Atterberg Limits Casagrande [AS 1289.3.1.2, AS 1289.3.2.1, AS 1289.3.3.1, AS 1289.3.4.1]			
Sample History	AS 1289.1.1	Air-dried	
Preparation	AS 1289.1.1	Dry Sieved	
Linear Shrinkage (%)	AS 1289.3.4.1	5.5	
Mould Length (mm)		125.3	
Crumbling		No	
Curling		No	
Liquid Limit (%)	AS 1289.3.1.2	18	
Method		One Point	
Plastic Limit (%)	AS 1289.3.2.1	12	
Plasticity Index (%)	AS 1289.3.3.1	6	

Comments

N/A

Report No: MAT:WHL18-0299-S6

Issue No: 1

Material Test Report

Client: ALS
C/O 2/19 Finchley Street
Milton QLD 4064

Project: Sample Testing (PO 503368)

Project Location: Stafford (ALS Batch No. EB1807967)

Project Number: 1-20174



Accredited for compliance with ISO/IEC 17025 - Testing



NATA Accredited Approved Signatory: C. Ferguson-Hannah
Laboratory Number: (Senior Technician)

15301 Date of Issue: 13/04/2018

THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

Sample Details

Sample ID: WHL18-0299-S6

Field Sample ID:

Date Sampled: 28/03/2018

Source: Test Pit

Material: Unknown

Specification:

Sampling Method: As Supplied

Soil Description:

Sampled By: Client

Location Description: TP 07
0.4-0.6m

Test Results

Description	Method	Result	Limits
Atterberg Limits Casagrande [AS 1289.3.1.2, AS 1289.3.2.1, AS 1289.3.3.1, AS 1289.3.4.1]			
Sample History	AS 1289.1.1	Air-dried	
Preparation	AS 1289.1.1	Dry Sieved	
Linear Shrinkage (%)	AS 1289.3.4.1	13.5	
Mould Length (mm)		125.3	
Crumbling		No	
Curling		No	
Liquid Limit (%)	AS 1289.3.1.2	38	
Method		One Point	
Plastic Limit (%)	AS 1289.3.2.1	20	
Plasticity Index (%)	AS 1289.3.3.1	18	
Date Tested		12/04/2018	

Comments

N/A

Report No: MAT:WHL18-0299-S7

Issue No: 1

Material Test Report

Client: ALS
C/O 2/19 Finchley Street
Milton QLD 4064

Project: Sample Testing (PO 503368)

Project Location: Stafford (ALS Batch No. EB1807967)

Project Number: 1-20174



Accredited for compliance with ISO/IEC 17025 - Testing



NATA Accredited Approved Signatory: C. Ferguson-Hannah
Laboratory Number: (Senior Technician)

15301 Date of Issue: 13/04/2018

THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

Sample Details

Sample ID: WHL18-0299-S7

Field Sample ID:

Date Sampled: 28/03/2018

Source: Test Pit

Material: Unknown

Specification:

Sampling Method: As Supplied

Soil Description:

Sampled By: Client

Location Description: TP 09
0.1-0.3m

Test Results

Description	Method	Result	Limits
Atterberg Limits Casagrande [AS 1289.3.1.2, AS 1289.3.2.1, AS 1289.3.3.1, AS 1289.3.4.1]			
Sample History	AS 1289.1.1	Air-dried	
Preparation	AS 1289.1.1	Dry Sieved	
Linear Shrinkage (%)	AS 1289.3.4.1	7.0	
Mould Length (mm)		125.2	
Crumbling		No	
Curling		No	
Liquid Limit (%)	AS 1289.3.1.2	23	
Method		One Point	
Plastic Limit (%)	AS 1289.3.2.1	12	
Plasticity Index (%)	AS 1289.3.3.1	11	
Date Tested		12/04/2018	

Comments

N/A

Report No: MAT:WHL18-0299-S8

Issue No: 1

Material Test Report

Client: ALS
C/O 2/19 Finchley Street
Milton QLD 4064

Project: Sample Testing (PO 503368)

Project Location: Stafford (ALS Batch No. EB1807967)

Project Number: 1-20174



Accredited for compliance with ISO/IEC 17025 - Testing



NATA Accredited Approved Signatory: C. Ferguson-Hannah
Laboratory Number: (Senior Technician)

15301 Date of Issue: 13/04/2018

THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

Sample Details

Sample ID: WHL18-0299-S8

Field Sample ID:

Date Sampled: 28/03/2018

Source: Test Pit

Material: Unknown

Specification:

Sampling Method: As Supplied

Soil Description:

Sampled By: Client

Location Description: TP 10
0.5-0.6m

Test Results

Description	Method	Result	Limits
Atterberg Limits Casagrande [AS 1289.3.1.2, AS 1289.3.2.1, AS 1289.3.3.1, AS 1289.3.4.1]			
Sample History	AS 1289.1.1	Air-dried	
Preparation	AS 1289.1.1	Dry Sieved	
Linear Shrinkage (%)	AS 1289.3.4.1	10.0	
Mould Length (mm)		125.1	
Crumbling		No	
Curling		No	
Liquid Limit (%)	AS 1289.3.1.2	30	
Method		One Point	
Plastic Limit (%)	AS 1289.3.2.1	15	
Plasticity Index (%)	AS 1289.3.3.1	15	
Date Tested		12/04/2018	

Comments

N/A

APPENDIX D

Important Information

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